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Supplement 62

Diseases of Cereal and Forage Crops

In the United States in 1927

August 1, 1928



BUREAU OF
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DISEASES OF CEREAL AND FORAGE CROPS IN THE UNITED STATES IN 1927.

Plant Disease Reporter.
Supplement 62.

August 1, 1928.

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FOREWORD

This report on diseases of cereal and forage crops in 1927 is based on information received by the Plant Disease Survey from various sources, particularly collaborators. Out of the total of 2597 individual disease reports and literature references on cereal diseases received during the year collaborators sent in 1730.

The writer wishes to take this occasion to thank collaborators and members of the Office of Cereal Crops and Diseases and Vegetable and Forage Diseases, as well as other pathologists for supplying information for this report.

An effort has been made this year to condense and shorten this summary. For this reason fewer reports of collaborators have been quoted and the list of literature references has been reduced by including only those references that appear to be most important.

Special surveys were made in Iowa and Utah in 1927. Additional facts concerning cereal diseases in those states, not included in this summary, may be found in the reports of those surveys. (Plant Disease Reporter Supplements 58 and 59).

DISEASES OF CEREAL CROPS

W H E A T

STINKING SMUT OR BUNT CAUSED BY *TILLETIA LAEVIS* KÜHN AND *T. TRITICI* (BJERK.) WINT.

Stinking smut continued unusually prevalent in 1927. East of the Mississippi River, with the exception of Virginia and Delaware, it seemed to be generally even more prevalent than last year. Also in the durum wheats of the Dakotas an increase over last year and the average year seemed evident. However, in Kansas, where the losses have been heavy recently, it was said to be of much less importance than last year, especially in the hard red wheats of

Wheat - Stinking Smut

the western part of the state, but appeared in increased amounts in the soft wheats of eastern Kansas. Marked decreases were reported from Colorado and California where intensive seed treatment campaigns have been in progress. Minnesota, Iowa, and Missouri reported only slight amounts of bunt.

For the country as a whole it is probable that, owing to a decrease in some of the states of largest production, the losses will not total as much as in 1926.

Table 73 gives a comparison of the estimated percentage losses for the past two years.

Table 73. Estimated percentage loss from bunt of wheat in 1926 and 1927.

State	Estimated percentage loss:		State	Estimated percentage loss	
	1927	1926		1927	1926
N. Y.	2	0.2	N. D.	2.5	2
Pa.	6.3	6	S. D.	2	1
Del.	3.5	3.5	Neb.		6
Md.	2	3	Kans.	2.6	10
Va.	3	5	Tenn.	2	-
W. Va.		trace	Texas	-	0.5
N. C.	4	4	Okla.	-	0.75
Ohio	2	0.5	Ark.	-	trace
Ind.	3	4	Mont.	-	2
Ill.	3.9	0.7	Colo.	5	8
Mich.	5	4	Ariz.	-	5
Wisc.	0.3	-	Idaho		6
Minn.	trace	0.5	Wash.		2
Iowa	trace	0.5	Oreg.		3
Mo.	trace	trace	Calif.		1

Some collaborators report on prevalence and severity as follows:

Pennsylvania: Number of acres surveyed - 2,468.

Per cent infection in 194 untreated fields - 7.24.

" " " 60 fields treated with 50% CuCO₃ - .0396
 " " " 20 " " 20% " - .437
 (Kirby)

Maryland: Out of 342 fields inspected, 151, or 44 per cent, had more than 1 per cent smutted heads. Fifty-nine fields, or 17 per cent, had 1 per cent or less, and 64 fields, or 19 per cent, had a trace. In 68 fields (20 per cent) none was found. (Jehle)

North Carolina: Observed in 14 out of 16 fields examined in the Piedmont Section. From all accounts it is common each year. Several fields unfit for milling. (Fant)

Wheat - Stinking Smut

Indiana: Very prevalent and attracted much attention- in fact caused widespread concern. Mr. L. C. Cochran, student assistant, made a survey of seven farms in Clinton County to obtain data on loss from bunt due to discounts. This was done after harvest and was based on counts made on the grain and information from the growers.

Farm no.	Wheat acreage	Total bushels	No. of grains examined	Per cent bunt	Loss
1	26	620	1,000	1.3	\$1.00 per acre, estimate
2	26	590	1,000	1.8	Docked \$.02 per bu. (\$11.80)
3*	23	195	600	7.5	Unsalable
4	30	690	1,000	0.5	Docked \$.03 (\$20.70)
5*	23	345	800	5.0	Docked \$.05 (\$17.25)
6	20	520	1,000	0.4	\$.50 per acre, estimate.
7	50	1,200	2,000	0.7	\$.50 per acre, estimate.

*Note low yields correlated with high per cent bunt.

50 per cent of the farmers did not treat seed grain in this region.
(M. W. Gardner)

Montana: In northern part of Gallatin Valley. Nineteen fields of winter wheat averaged 3.2 per cent bunt. Highest - 100-acre field with 20 per cent smut. (Morris)

Utah: Of 148 fields examined, 80, or 54 per cent showed bunt, and 46 of them, or 31 per cent, contained more than a trace of the disease. The average infestation was 2.2 per cent. (Linford)

In order to obtain information on losses because of dockage, Tehon in Illinois sent questionnaires to members of the Illinois Grain Dealers Association. Two hundred and twelve dealers furnished reports which when compiled showed:

"The actual money loss either to growers or dealers was \$64,956.77, this being the total dockage actually made on 775,192 bushels, an average dockage of 8.3 cents per bushel for all bushels docked. There were, however, 284,213 bushels reported more or less smutty but not docked, thus bringing the total amount of infested wheat to 1,059,405 bushels. Of the 4,146,360 bushels reported marketed, the total smutty wheat constituted 25.5 per cent, that to which dockage was applied constituted 18.7 per cent, and that to which dockage was not applied constituted 6.8 per cent.

Wheat - Stinking Smut

"The estimated wheat production in Illinois during 1927, according to the Illinois Crop Reporter of November 1, 1927, is 33,411,000 bushels. On this basis, the following smut estimates are made for the entire crop of the state:

"Total bushels of smutty wheat.....	8,519,805
"Total bushels of smutty wheat docked.....	6,247,857
"Total bushels of smutty wheat not docked.....	2,271,948
"Total probable money loss by dockage at 8.3 cents per bushel.....	\$518,572.13"

Several cases of exceptional damage were reported. In Pennsylvania, R. S. Kirby observed the worst infestation he has seen, 85 per cent. In Michigan the Division of Botany reported "heaviest infestation yet observed in Michigan. Field after field in northern Michigan showed a loss of over 90 per cent." Other maximum percentages of infected heads were: 75 per cent, New Mexico; 65 per cent, New York; 54 per cent, Kansas; 50 per cent, North Dakota; 41 per cent, Illinois; 37 per cent, Utah; 35 per cent, Colorado; 30-35 per cent, Oklahoma; and 10 per cent Wisconsin and Virginia.

Several collaborators mention correlation of heavy infection with late planting. In Oklahoma, Colorado, and Delaware the fields with maximum infection were planted later. In Pennsylvania three acres of Pennsylvania 44 wheat planted September 30 showed 2 per cent bunt while 10 acres of the same wheat planted October 15 showed 20 per cent.

Gaines (2,3) and Stephens (5) have recently reported new physiologic forms of Tilletia tritici in the Northwest. The former offers the suggestion that a possible reason for the gradual increase of bunt in America during the last few years is on account of the introduction and spread of new physiologic forms.

A few new facts concerning the geographic distribution of the two species of bunt have been reported during the year. In Connecticut only one infested field was observed. This field showed 10 per cent infection. Of the samples taken from it all proved to be Tilletia laevis except one spike which was infected with Tilletia tritici. The occurrence of this latter species in New England is not common. In Michigan the notation was made that the bunt in the badly diseased fields of the northern part of the state was chiefly T. laevis. In Utah head samples from 72 fields were examined microscopically and the two fungi were found in about equal amounts. In Washington, Heald reported that

"Tilletia tritici is still the predominating species but T. laevis has appeared in several localities especially in the drier portion of the wheat area."

Varieties that were thought to be resistant or immune at Moro, Oregon, such as White Odessa, Martin, Hussar, Ridit and Albit showed considerable infection in 1927. Stephens (5) and Gaines (2) reported other similar cases. Presumably these were on account of a new physiologic form of bunt. Hussar and also C. I. 4843 were said to be immune in Indiana according to E. B. Mains. Hope was said to be very resistant in North Dakota as was Berkley Rock in Pennsylvania. Other varieties said to be resistant were Purkoff and Fultz in Pennsylvania, and Harvest Queen and Red Wave in Illinois.

Wheat - Stinking Smut

Notes on control follow:

New York: About 2,500 bushels of seed wheat were treated in Cayuga County. (Chupp)

Pennsylvania: High grade copper carbonate again appears to be a very effective control measure but the low grade is only moderately effective. (Kirby)

Maryland: In the fall of 1927 about 203,883 bushels of wheat were treated for smut, 29,011 pounds of dust, mostly 20 per cent CuCO_3 were used. (Jehle)

Virginia: Bunt occurred in 40 per cent of the 116 fields in ten counties examined. In forty-six fields seed was treated with copper carbonate. (Fromme)

North Carolina: CuCO_3 where used has given good results. (Fant)

Kansas: Seed treatment campaign gradually reducing bunt. (Johnston)

Colorado: Eighty to 90 per cent of farmers treated their seed (for the 1927 crop). An average of only 1.30 per cent smut was found by actual count of farms where pure copper carbonate was used, while fields where no seed treatment has been given showed 20 to 25 per cent smut. (W. Kidder)

A combination recleaning and seed treating outfit mounted on an automobile truck has been operated very successfully in San Luis Obispo County, California, during the past year. (Coke (1)).

Recent literature

1. Coke, J. Earl. Cleaning up on wheat smut. Extension Pathologist (Mimeo.) 6: 16-18. Feb. 1928.
2. Gaines, E. F. New physiologic forms of *Tilletia tritici* in wheat. (Abstract) Phytopath. 18: 139. 1928.
3. _____ Why smut is increasing. Extension Pathologist (mimeo.) 6: 14-15. Feb. 1928.
4. Rodenhiser, H. A., and E. C. Stakman. Physiologic specialization in *Tilletia laevis* and *Tilletia tritici*. Phytopath. 17: 247-253. Apr. 1927.
5. Stephens, D. E. Cereal Courier 19: 216. July 10, 1927.
6. Thomas, R. C., W. G. Stover, and H. A. Runnels. Dust treatments for the control of stinking smut of wheat. Ohio Agr. Exp. Sta. Bimonth. Bull. 12: 115-117. July-Aug. 1927.
7. Tisdale, W. H., C. E. Leighty, and E. G. Boerner. A study of the distribution of *Tilletia tritici* and *T. laevis* in 1926. Phytopath. 17: 167-174. Mar. 1927.

LOOSE SMUT CAUSED BY USTILAGO TRITICI (PERS.) ROSTR.

Loose smut occurred in about the average amounts according to reports submitted from the majority of the states. Somewhat less than usual, however, was noted in Pennsylvania, Maryland, Iowa, and South Dakota.

In Michigan the smut seemed to be more prevalent in the northern than in the southern part of the state. In Idaho and Utah it was said to be common in the irrigated but not in the dry land sections.

The estimates of losses are given in table 74.

Table 74. Percentage losses from loose smut of wheat in 1927 as estimated by collaborators. (Figures in parentheses indicate the maximum percentage of infection in any one field).

Percentage : loss : States reporting		:: Percentage : loss : States reporting	
2.5	: Virginia (3.5)	::	: Texas, Utah (15)
2	: Indiana, North	::	: Idaho
	: Dakota (15)	:: 0.8	: Illinois (4.7)
1.5	: Pennsylvania (12.5)	:: 0.5	: Maryland, Tennessee
	: Michigan	:: trace	: Maine, Delaware,
1	: Connecticut, New	::	: Wisconsin, Iowa (5)
	: York, North Caro-	::	: Kansas, Wyoming,
	: lina, Ohio, Minne-	::	: Colorado (5),
	: sota (10), Missouri	::	: Washington
	: (4), South Dakota,	::	

Varietal resistance was reported as follows:

Varieties reported very resistant: Leaf and Gold Coin in Pennsylvania.

Varieties reported resistant: Fultz and Forward in Pennsylvania; Mediterranean, Rudy and Red Wave in Illinois (according to field observations).

Varieties reported susceptible: Pennsylvania 44 and Fulcaster in Pennsylvania; Fulcaster, Fultz, Harvest Queen, and Kanred in Illinois (field observations).

Varieties reported very susceptible: Red Rock and Dowson in Pennsylvania; Turkey and Valley in Illinois (field observations); Kota in North Dakota.

C. O. Johnston stated that soft winter wheats such as Harvest Queen in northeastern Kansas showed 10 per cent while hard red winter wheats showed a trace.

Wheat - Loose Smut

Recent literature

1. Sherbakoff, C. D. Seed treatment for wheat, barley, and oat smuts. Tennessee Agr. Exp. Sta. Circ. 16: 2 p. 1927.
2. Tisdale, W. H., and V. F. Tapke. Smuts of wheat and rye and their control. U. S. Dept. Agr. Farm. Bull. 1540. 16p. Dec. 1927.

FLAG SMUT CAUSED BY *UROCYSTIS TRITICI* KOERN.

P. A. Glenn reported on the situation in Illinois as follows:

"No extensive survey was made for flag smut last year. While passing through the infested area of Madison County, I examined twenty-five or thirty fields in what was once the generally infested area, and succeeded in finding but one diseased plant, which indicates that flag smut, in Madison County at least is at a very low ebb.

"For the last three years we have had lots of rain between harvest and sowing time and three years ago we had a very hard winter that killed out most of the wheat. I think that these climatic conditions have had much to do with the almost disappearance of flag smut."

No reports were received from the other two states, Missouri and Kansas, where the disease is known to occur.

Recent literature

1. Tisdale, W. H., C. E. Leighty, and B. Koehler. Further studies on flag smut of wheat. U. S. Dept. Agr. Dept. Circ. 424. 12p. 1924.

STEM RUST CAUSED BY *PUCCINIA GRAMINIS* PERS

The year 1927 will be remembered as a year when stem rust was epiphytotic in parts of the spring wheat area - southern Minnesota and eastern North and South Dakota. It was a year when weather conditions generally seemed favorable for rust development and the majority of wheat states from Colorado eastward reported more than usual. The situation in the spring wheat states is well summarized in the Rust Reporter for October 15, 1927.

"About the middle of July the stem rust epidemic in the spring wheat area became threatening. It was apparent that wheat in southern Minnesota was doomed. The initial infection in this region seemed to be heavier than it was farther west. For several weeks, however, wheat and oats in northern South Dakota, eastern North Dakota, and northwestern Minnesota were threatened also. There was plenty of rust, the outcome would depend entirely on the weather.

"At harvest time there was from 70 to 90 per cent stem rust on every susceptible plant of wheat and oats in eastern North Dakota, and in Minnesota.

Wheat - Stem-Rust

"The loss in most of South Dakota and western North Dakota, however, was slight. There was considerable loss in northeastern South Dakota, where the grain was late. Wheat in the Red River Valley escaped with only moderate loss. But southern and central Minnesota could not escape. Stem rust destroyed from 50 to 75 per cent of the wheat in the average field in this region. There is also some evidence that leaf rust alone took a toll of 10 per cent."

Concerning the situation in other states collaborators report as follows:

Pennsylvania: Observed in 35 per cent of the fields surveyed; average infection 1.44 per cent. (Kirby)

Maryland: Was severe in certain localities. (Jehle)

Virginia: Severe in certain fields in Pulaski County, Berberis canadensis nearby.

North Carolina: Occurrence confined to mountain counties. (Lehman)

Ohio: The general sprinkling of stem rust was heavier for the state as a whole than it has been in the last eight years. The source of this sprinkling of rust remains a conjecture. Most of the wheat in the state escaped damage. The loss will probably not exceed 1 per cent of the total crop. (Baringer)

Indiana: Only a trace found. (Leer)

Illinois: Very little in northern part of state until the second week in July, when a heavy infection suddenly appeared on spring wheat and late oats. On July 23 there were prospects of some loss due to stem rust on these grains but at harvest time it appeared that most of the spring wheat and oats had escaped with only slight loss. (Rust Reporter, Oct. 15)

Michigan: Wet spring insured heavy infection on barberries but continued cold checked rapid spread to fields some distance from barberries. (Div. of Botany)

Iowa: In general winter wheat matured and was harvested with a trace to 1 per cent infection although a number of reports were received of severe infection and damage particularly in Warren County. Spring wheat had a trace to 1 per cent infection in northwestern Iowa and suffered more damage than winter wheat. Spring wheat plantings were not common this year, however. The reduction in prevalence and loss is due directly to the drouth conditions which existed until near harvest time. (Archer)

Missouri: Not so severe as usual, while per cent of infection was as great the number of sori per plant was much less so that actual injury was greatly reduced. (Scott)

Wheat - Stem Rust

Nebraska: Winter wheat - only a trace at harvest and no loss. Spring wheat - more than in winter wheat. There was probably 5 per cent severity and 20 per cent prevalence in northern counties and a trace in the southern counties. (Thiel)

Kansas: Developed late in the season in northern Kansas and became severe in only occasional fields. In southern Kansas it developed earlier and considerable damage was done in some fields. (Johnston)

Wyoming: A sprinkle of stem rust over southern Wyoming but hardly enough to do much damage. Much of the wheat was being cut at that time (August 31). (Lungren, Sept. 3. Cereal Courier 19: 302. Sept. 10)

Colorado: No loss in winter wheat and most of the spring wheat was cut before rust did any damage. The weather was favorable for rust throughout the growing season but there was no rust epidemic. (Lungren, l. c.)

Utah: Very little seen in July. During early August, however, rust quickly became widespread in late irrigated spring wheat. In many fields the injury was negligible but in others there was rather severe injury. Several fields suffered injury of 5 per cent or above. (Linford)

Washington: Present. Can be found in traces in low areas. (Heald)

Table 75. Percentage loss from stem rust of wheat as estimated by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
30	Minnesota	0.5	Pennsylvania, Kansas,
10	North Dakota,	0.1	Texas
	South Dakota	trace	Virginia, Nebraska,
1.5	Wisconsin		Montana
1	Maryland, Michigan, West Virginia		New York, New Jersey
			North Carolina, Ohio,
			Indiana, Missouri,
0.75	Illinois		Kentucky, Tennessee,
			Wyoming, Colorado, New
			Mexico, Utah, Idaho

Table 76. Dates and places of first observation of stem rust on barberry and wheat in 1927, as reported to the Survey.

Date	Place	County	State	Observer
<u>On barberry bushes</u>				
April 11	Columbus	Franklin	Ohio	Baringer
20	---	Colfax	Nebraska	Thiel
27	Maryville	Nodaway	Missouri	Smith
28	---	Ingham	Michigan	Reddy
28	---	Wayne	Iowa	Smith
28	Bement	Piatt	Illinois	Bills
28	---	Washington	Minnesota	Walker
30	Madison	Dane	Wisconsin	Jackson
May 2	Rochester	Fulton	Indiana	Leer

Wheat - Stem Rust

Date	:	Place	:	County	:	State	:	Observer
May 13	:	Bell	:	Prince Georges	:	Maryland	:	Humphrey
13	:	Hiawatha	:	Brown	:	Kansas	:	Schrivner
17	:	Lexington	:	Fayette	:	Kentucky	:	Valleau
18	:	Volza	:	Brookings	:	South Dakota	:	Hutton
June 4	:	Loveland	:	Larimer	:	Colorado	:	Lungren
<u>On wheat</u>								
May 19	:	Columbus	:	Franklin	:	Ohio	:	Baringer
21	:	Assaria	:	Saline	:	Kansas	:	Schrivner
June 3	:	Pratte	:	Pratte	:	Kansas	:	Thiel
7	:	Bruning	:	Thayer	:	Nebraska	:	Humphrey
14	:	Brookings	:	Brookings	:	South Dakota	:	Michaels
18	:	---	:	Jay	:	Indiana	:	Leer
21	:	Buffalo Lake	:	Renville	:	Minnesota	:	Cotter
	:	St. Bonifacius	:	Hennepin	:	Minnesota	:	Cotter
22	:	Wahpeton	:	Richland	:	North Dakota	:	Butler
22	:	Sawville	:	Ozaukee	:	Wisconsin	:	Walker
	:		:		:		:	Christensen
26	:	Yuma	:	Yuma	:	Colorado	:	Lungren

Recent literature

1. Aamodt, O. S. A study of growth habit and rust reaction in crosses between Marquis, Kota, and Kanred wheats. *Phytopath.* 17: 573-609. Sept. 1927.
2. Aamodt, O. S. Breeding wheat for resistance to physiologic forms of stem rust. *Jour. Amer. Soc. Agron.* 19: 206-218. Mar. 1927.
3. Bailey, D. L., and F. J. Greaney. Field experiments on the control of stem rust by sulphur dust. *Scient. Agric.* 7: 153-156. 1927.
4. Durrell, L. W., and E. A. Lungren. Barberry eradication and sources of black stem rust in Colorado. *Colorado Agric. Exp. Sta. Bull.* 315. 18p. 1927.
5. Greaney, F. J. Studies on the toxicity and fungicidal efficiency of sulphur dusts in the control of some cereal rusts. *Sci. Agr.* 8: 316-331. Jan. 1928.
6. Hutton, Lynn D. Barberry species that spread stem rust. *Nat. Hort. Mag.* 7: 5-8. Jan. 1928.
7. Kempton, F. E., and L. D. Hutton. Report of progress in barberry eradication for the calendar year ended December 31, 1926. *Cereal Courier* 19: 49-62. Feb. 28, 1927.
8. Newton, M., and T. Johnson. Color mutations in *Puccinia graminis tritici* (Pers.) Erikss. and Henn. *Phytopath.* 17: 711-725. Oct. 1927.

Wheat - Stem Rust

9. Greenhouse experiments on the relative susceptibility of spring wheat varieties to seven physiologic forms of wheat stem rust. *Sci. Agr.* 7: 161-165. 1927.

10. Newton, M., and T. Johnson. Physiologic forms of wheat stem rust in western Canada. *Sci. Agr.* 7: 158-161. 1927.

11. Melander, L. W., and J. H. Craigie. Nature of resistance of *Berberis* spp. to *Puccinia graminis*. *Phytopath.* 17: 95-114. 1927.

12. Patch, E. M. Bread or barberries. U. S. Dept. Agr. Misc. Publ. 7. 14p. Jan. 1928.

13. Peltier, G. L., and A. F. Thiel. Stem rust in Nebraska. *Nebraska Agr. Exp. Sta. Res. Bul.* 42. 40 p. 1927.

14. Stakman, E. C., F. E. Kempton, and L. D. Hutton. The common barberry and black stem rust. U. S. Dept. Agr. Farm. Bull. 1544. 28 p. Nov. 1927.

LEAF RUST CAUSED BY *PUCCINIA TRITICINA* ERIKS.

Collaborators are almost unanimous in reporting that leaf rust was more prevalent and destructive in 1927 than it has been for several years. This condition applied all over eastern United States and as far west as Colorado. Kirby reported it the most severe epiphytic ever occurring in Pennsylvania; Archer in Iowa said it was the most severe development witnessed in many years with wheat plants in some fields stunted to half their normal size; and Thiel in Nebraska said that it was more abundant than he had seen it in his seven years experience in the state. Some of the observations in prevalence and severity are as follows:

Spring wheat States: The season was, of course, exceptionally favorable for the development of rust. Some of the loss attributed to stem rust unquestionably was caused by leaf rust, particularly on susceptible varieties like Ruby, Quality, and Kota. There is some evidence that the reduction in yield due to leaf rust was from five to seven bushels an acre. These estimates are based on the results of dusting experiments in which leaf rust was controlled and in which very little stem rust developed on the checks. (Stakman)

Pennsylvania: Average percentage of infection 62 per cent. The rust appeared early and developed into one of the most severe epidemics ever occurring in this state. (Kirby)

North Carolina: Very prevalent this year. (Lehman)

Texas: Very prevalent; 3 per cent loss. (Taubenhaus)

Oklahoma: Very severe, Stillwater, May 12. (C. O. Johnston)

Wheat - Leaf Rust

Michigan: Considerable leaf rust especially in northern part of state. Damage evident. (Div. Bot.)

Wisconsin: Very prevalent this year. Winter wheat in milk stage has leaves 75 to 100 per cent infected. (Vaughan)

Minnesota: There has been an unusually heavy epidemic of leaf rust on both spring and winter wheat throughout the state. Plants were practically defoliated and the heads ripened earlier. (Sect. Pl. Path.)

Iowa: The epidemic of leaf rust in Iowa this year was the most severe witnessed in many years. Extremely heavy infection occurred over the entire state; in fact some fields were so severely infected early in the season that the heads never formed, in others the plants were so badly checked in their growth that heads did not fill properly. Fields commonly had an 80 per cent infection. In northwestern Iowa in some fields a 100 per cent infection caused the plants to be stunted to half the normal size. In southwestern Iowa plants frequently had half of their leaves killed. The main factor influencing the cause of the epidemic probably can be traced to the damp, wet weather of May which was extremely favorable for winter wheat infection. (Archer)

Missouri: Heavy rainfall as well as mild winter was probably responsible for heavy infection. However, temperatures were low during May and June. 100 per cent infection only in one or two cases. Average 25 per cent. (Scott)

North Dakota: Very severe on spring wheat. Many of the more resistant varieties especially in the durum class have developed flecks. These have attracted the attention of many growers. (Brentzel)

Kansas: An extremely heavy infection of leaf rust of wheat occurred in most parts of Kansas this year. Only a small section in the western part of the state where the crop was injured by dry weather escaped. Many fields showed 70 to 100 per cent infection on all leaves. Reductions in yield of 2 to 20 per cent undoubtedly resulted.

Overwintered in abundance in Oklahoma and Texas and to a moderate degree in Kansas. It became severe early in the season and the most severe and widespread epidemic of recent years developed. (C. O. Johnston)

Colorado: More prevalent this year than in the past five years. Very heavy in eastern Colorado on winter wheat; also prevalent in the spring-wheat area. (E. A. Lungren)

Utah: This has continued to be a negligible factor in the irrigated wheat examined this summer. (Linford)

Washington: Present but of moderate importance. (Sect. Pl. Path.)

It is probable that we have been underestimating the losses from leaf rust in the past. We have not attached enough importance to this disease. This

Wheat - Leaf rust

may be concluded from the work of E. B. Mains (Pl. Dis. Repr. 11: 168-169. Nov. 15, 1927) in Indiana who dusted wheat in 1927 for rust control. The yield in the sulfur-dusted plots of winter wheat, where leaf rust was suppressed, was 10.9 per cent more than in the checks and 24.3 per cent more than the checks in the case of spring wheat. This was on wheat showing 75 to 100 per cent infected leaf area just before ripening. On the basis of these experimental data Mains estimated the loss for Indiana at 13 per cent. The estimation of losses in other states show considerable variation a part of which may be due to different opinions as to the amount of loss that leaf rust is capable of producing.

Table 77. Estimated percentage loss from leaf rust of wheat as estimated by collaborators, 1927.

Percentage loss		Percentage loss	
	States reporting		States reporting
20	Tennessee	2	South Carolina, North
15	Iowa		Dakota
13	Indiana	1.5	Virginia
8	Kansas	1	New York, West Virginia
6	Pennsylvania		Michigan
3	North Carolina	0.5	Maryland, Ohio
	South Dakota	trace	Delaware, Wisconsin
	Minnesota, Texas		Missouri, Colorado,
2.5	Illinois		Utah, Idaho

Table 78. Dates and places of first observation of leaf rust of wheat, as reported by collaborators, 1927.

Date	Place	County	State
April 4	Ullin	Pulaski	Illinois
11	Clemson College		South Carolina
May 4		Jackson	Indiana
19	Bridgeville		Delaware
20	Madison		Wisconsin
June 1	State College		Pennsylvania
1			Colorado
10		Tompkins	New York
20	Fargo		North Dakota
29		Weber	Utah
July 1	Bozeman		Montana
13	Wallingford	New Haven	Connecticut

Notes on susceptibility of varieties follow:

Pennsylvania: Susceptible - Pennsylvania 44, Leap, Forward, Fulcaster, Fultz. Very susceptible - Red Rock.

North Carolina: Resistant - Fulcaster. Susceptible - Leaps Prolific, Purple Straw, Alabama Blue Stem.

Illinois: Field examination shows as follows: Resistant - Kanred, 7 per

Wheat - Leaf Rust

cent; Marquis, 8 per cent; Mediterranean, trace. Susceptible - Ohio 127, 26.5 per cent; Turkey, 30 per cent; Fulcaster, 30.4 per cent; Fultz, 33.1 per cent; Valley, 37.1 per cent. Very susceptible - Flint, 42.6 per cent; Harvest Queen, 42.1 per cent; Red Wave, 47.6 per cent.

South Dakota: Very resistant - durums. Resistant - Marquis. Very susceptible - Kota, Ruby, and Quality.

Kansas: Very resistant - Karvale, Kanmarq, Fulhard. Susceptible - Turkey, Blackhull, Kanred. Very susceptible - Burbank Super.

Recent literature

1. Allen, Ruth F. A cytological study of orange leaf rust *Puccinia triticina* physiologic form 11, on Malakoff wheat. *Jour. Agr. Res.* 34: 697-714. 1927.
2. Tehon, L. R. Epidemic diseases of grain crops in Illinois, 1922-1926. The measurement of their prevalence and destructiveness and an interpretation of weather relations based on wheat leaf rust data. *Bull. Nat. Hist. Surv. Illinois* 17: 1-96. Oct. 1927.

SCAB CAUSED BY *GIBBERELLA SAUBINETII* (MONT.) SACC.

Scab was said to be more prevalent than usual in New York, Delaware, Virginia, Indiana, Illinois, and Missouri. In the last three states it was especially troublesome. For the country as a whole it was generally more prevalent than last year. Some of the collaborator's reports on prevalence follow:

Delaware: Heaviest infection observed during the past seven years. Complete infection of entire head commonly found, June 16 (Adams)

Pennsylvania: Observed in many of the wheat fields surveyed, but due to more or less dry weather after the wheat came into flower, it is only slightly more severe than last year. (Kirby)

Illinois: There is a high percentage of wheat scab in the southern half of Illinois this season. Some fields are running as high as 30 per cent infection. Even in Turkey wheat, infection is running up as high as 10 per cent. The northern third of the state seems to have escaped pretty well, at least in sections which I have visited. (B. Koehler)

Iowa: In 1927 infection was unusually slight. Only a rare head could be found and this usually with just a few of the kernels infected. In an average year the loss is estimated as a trace; rarely the loss is more, i.e. 4 per cent in 1923 and 5 per cent in 1924. (Archer).

Missouri: Scab is more severe this season than any year since 1919. Some fields observed show some scab on as many as 50 per cent of the heads. The season has been unusually favorable for scab infection in this state as there has been an abnormally heavy rainfall during April, May, and the early part of June, with much cloudy weather. (Scott)

Kansas: Only a few scattered reports of scab limited to soft wheats in southeastern Kansas. (Johnston)

Wheat - Scab

Table 79. Estimated losses from wheat scab as reported by collaborators, 1927.

Percentage : loss	States reporting	Percentage : loss	States reporting
4.9	: Illinois	:: trace	: Virginia, West Virginia
4	: Missouri	::	: North Carolina,
2	: Indiana	::	: Tennessee, Ohio, Michigan
1	: Maryland, North	::	: Wisconsin, Minnesota.
	: Dakota	::	: Iowa, South Dakota
0.5	: Pennsylvania, Delaware,	::	:
	: Kentucky	::	:

Reduction in yield is not the only way that losses from scab occur as will be seen from the following quotation from I. T. Scott in Missouri. The poor seed wheat in the areas where the disease was worst is liable to result in considerable seedling blight in 1928.

"Due to the serious infection of wheat with scab this season much concern is being shown by growers in obtaining clean seed for fall sowing. The weight of much grain is lowered this season because of the presence of many scabby grains. Germinator tests show low germination with the development of much mold on the seedlings which has been found to be Gibberella in practically all cases. It is feared that the use of this year's grain for seed will result in large losses from seedling blight and in poor stands, particularly if the coming season is favorable for this disease. Fanning and seed treatment is being recommended, especially where germinator tests show much scab."

In Illinois, a field with as high as 32 per cent infected spikelets was seen. In this field 37.2 per cent of the heads were scabbed and on them an average of 88.1 per cent of the spikelets were diseased. This means 32 per cent loss. As high as 65 per cent infected heads was observed in Missouri and 20 per cent was observed in Pennsylvania.

Table 80. Dates and places of first observation of wheat scab as reported by collaborators, 1927.

Date	:	Place	:	County	:	State
June 1	:		:			
1	:	Filmore	:			: Missouri
2	:	Central City	:	Marion		: North Dakota
16	:	Georgetown	:	Sussex		: Illinois
18	:	State College	:			: Delaware
28	:	Conesville	:			: Pennsylvania
July 7	:	Ithaca	:	Tompkins		: Iowa
23	:	Northville	:	Rice		: New York
25	:	Madison	:			: Minnesota
						: Wisconsin

Field examinations showed the following percentages of infection in different wheat varieties in Illinois:

Resistant - Kanred trace; Marquis 1.3 per cent; Rudy trace; Valley, 1.8 per cent.

Wheat - Scab

Susceptible - Flint 4.3 per cent; Fultz 3.7 per cent; Red Wave 3.4 per cent; Harvest Queen 3.2 per cent.

Very susceptible - Turkey 11.6 per cent.

Fulcaster and Mediterranean were mentioned as susceptible by Scott in Missouri, and soft wheats only showed infection in Kansas according to Johnston.

ERGOT CAUSED BY CLAVICEPS PURPUREA (FR.) TUL.

In Minnesota and North Dakota traces of ergot were reported on durum wheats. E. B. Mains of Indiana reported traces in some of the spring wheats especially in the F₁ of hybrids of a Chinese wheat.

ANTHRACNOSE CAUSED BY COLLETOTRICHUM GRAMINICOLUM (CES.) WILS.

Ten states, from Pennsylvania to Kansas, reported anthracnose in 1927. In Pennsylvania, according to Kirby, it was more prevalent than usual causing an estimated reduction in yield of 2.5 per cent. The average infection was 13.8 per cent with as high as 90 per cent infection observed in one field. Of the 281 fields surveyed 77 per cent showed the disease. In Illinois, where also anthracnose was more prevalent than usual, G. L. Stout reported the losses as a trace. In one field 20.3 per cent of the leaf and stem area was diseased. Field observations showed the varieties Harvest Queen and Fultz to be susceptible. In Kansas, according to C. O. Johnston,

"The disease is not common and probably there was no damage except in isolated cases such as one in Montgomery County where injury was severe."

Other losses reported were: Ohio, 0.1 per cent; Indiana, 1 per cent; and Illinois and Wisconsin each a trace.

GLUME BLOTH CAUSED BY SEPTORIA NODORUM BERK.

Glume blotch was reported from the majority of eastern wheat states. It was not reported from west of Kansas. In general it was rated as unimportant causing little or no loss but in Maryland when 3 per cent loss was estimated it was considered one of the important diseases. It was also troublesome in Pennsylvania (1.5 per cent loss) and was serious, locally at least, in North Carolina. Other states reporting did not mention more than a trace.

Delaware: More than usual. Wet weather favored development. (Adams)

Pennsylvania: More. Average per cent infection found 16.1. Of the fields inspected 99.4 per cent showed the disease. (Kirby)

North Carolina: In one field observed loss due to this disease was about 50 per cent. Attacked nodes causing a high percentage of the culms to break over before harvest. Infection was leaf and stem chiefly. Leap's Prolific susceptible. (S. G. Lehman)

Wheat - Glume Blotch

Illinois: Much more than usual. Of the 1927 acres examined only 450 showed infection and these showed 29.5 per cent of the spikelets infected. As high as 74.5 per cent infected spikelets was observed in one field. Field observations show: Red Wave, 1.2 per cent; Valley, 1.9 per cent; Flint, 0.11 per cent; Harvest Queen, 61.9 per cent; and Fultz, 44.7 per cent. (Tehon)

SPECKLED LEAF BLOTH CAUSED BY *SEPTORIA TRITICI DESM.*

This disease was widespread as usual. More than the average amount was reported from Pennsylvania, Indiana, Illinois, Kansas, and California. In Texas, Oklahoma, and Kansas it was reported by C. O. Johnston as causing severe damage to the lower leaves in May. Losses of 0.7 per cent in Illinois and 0.5 per cent in Indiana and Maryland were estimated. In California, according to Mackie, this disease was very important this year causing premature ripening, lodging and shriveling of the grain. Early sown wheat on summer fallowed land suffered the most in that state and losses of 60 to 70 per cent of the crop were noted.

The variety Velvet Chaff was said to be susceptible in Pennsylvania, and in Illinois field observations showed as follows: Varieties susceptible - Red Wave 23 per cent infected leaf area, Fulcaster 25 per cent. Varieties very susceptible - Fultz 40 per cent, Harvest Queen 54.7 per cent, Kanred 63 per cent, Turkey 54 per cent, Valley 54 per cent.

BLACK CHAFF CAUSED BY *BACTERIUM TRANSLUCENS UNDULOSUM S. J. & R.*

Scattered reports of occurrence were received from Iowa, Minnesota, North Dakota, South Dakota, Kansas, Colorado, Utah, and Idaho. North Dakota, with an estimate of 0.5 per cent reduction in yield, was the only state that reported more than a trace of loss. Durum, and hard red wheats in Iowa, and Kota in North Dakota were reported susceptible.

POWDERY MILDEW CAUSED BY *ERYSIPHE GRAMINIS DC.*

Powdery mildew occurred commonly as usual in the humid areas of both eastern and western United States and in some of the irrigated sections of the West. Pennsylvania, where 97 per cent of the fields showed the disease, was the only state reporting more than a trace of damage.

The varieties Norka and Michigan Amber 29-1-1-1 were reported immune by E. B. Mains in Indiana.

TAKE-ALL CAUSED BY *OPHIOBOLUS GRAMINIS SACC.*

Take-all was reported from three states, New York, Maryland, and California. In New York it appears to have been more serious than during any year since observations have been made, being reported from eight counties in the western part of the state - Cortland, Onondaga, Livingston, Wyoming, Yates, Genesee, Monroe, and Steuben, and causing an estimated loss of from 1 to 3 per cent. One field in Livingston County was observed with from 40 to 80 per cent in spots and another was seen in Wyoming County with 15 per cent reduction in yield.

In Maryland one spot from 15 to 20 feet in diameter was observed in one

Wheat - Take-all

field in Queen Anne's County. It was not at all prevalent in Maryland as shown by examinations in many fields.

In California, W. W. Mackie reported the disease occurring generally but mostly on the coast and in the Sacramento Valley.

Take-all was found and identified in Saskatchewan, Canada, in 1923 (1,2). In 1925 it was found on 225 quarter sections and only a small portion of the province was examined. Since 1923 it has been found also in Alberta, Manitoba, and Prince Edward Island.

Recent literature

1. Russell, R. C. "Take-all" - a destructive disease of wheat. Pamph. Canada Dept. Agr. n.s. 85. 8 p. 1927.
2. Sanford, G. B. Important soil-borne diseases of crops in western Canada. Scient. Agr. 7: 292-294. Apr. 1927.

BLIGHT CAUSED BY *HELMINTHOSPORIUM SATIVUM* PAM., KING, & BAK.
AND *HELMINTHOSPORIUM* SP.

Pennsylvania, Maryland, Indiana, Wisconsin, Minnesota, North Dakota, Iowa, Missouri, and California reported seedling, and head blights, foot rots, etc. due to *Helminthosporium* species, particularly *H. sativum*. In Pennsylvania, R. S. Kirby reported that root rot was observed in 16.4 per cent of the 281 wheat fields surveyed and was at least moderately destructive in 8.2 per cent of the wheat fields. It was very destructive where wheat followed wheat, and moderately destructive where that crop followed oats or barley. An estimated loss of 0.6 per cent occurred. This is a much greater prevalence than usual for Pennsylvania. Other estimates of losses were North Dakota, 1.5 per cent; Indiana, 0.1 per cent; and Maryland, Wisconsin, Minnesota, Kansas, and Idaho, each a trace.

Iowa: Losses from this disease have never been reported more than a trace. (Archer)

North Dakota: Prevalent in the eastern half of the state. Common in durum varieties. Not severe except in a few fields. (Brentzel)

Kansas: Although the season seemed very favorable this trouble did not seem to be more prevalent than usual. A *Helminthosporium* joint disease was more prevalent. (C. O. Johnston)

FOOT ROT

Foot rot caused by *Fusarium* was reported as more prevalent than last year by Kirby in Pennsylvania.

Foot and basal stem rot caused by species of *Helminthosporium* and *Fusarium* was thought to have caused a loss of about 1 per cent in Minnesota.

Foot rots of undetermined cause resulted in traces of loss in Kansas according to C. O. Johnston but there seemed to be no marked increase in the disease. Idaho and Washington reported about the usual amount of trouble.

NEMATODE, *TYLENCHUS TRITICI* (STEIN.) BAST.

Only three cases of nematode infestation were reported to the Survey, one in Maryland and two in Virginia. The latter two were of slight and moderate severity. The Maryland infestation was reported as follows by R. W. Leukel:

"During the summer and fall of 1926, the wheat nematode was found on one farm near Lisbon, Howard County, Maryland, and on seven farms southwest of Gaithersburg, Montgomery County, Maryland, as the result of special surveys conducted in cooperation with the Extension Service of the University of Maryland and contracts with commercial agencies. The infestation was comparatively light except in one case in Montgomery County where it was rather heavy. This farm was visited after threshing had been done and it was found that the infestation had occurred on 48 acres, hence the total loss was rather heavy, probably approximating upwards of 250 bushels of wheat. In all cases where the disease was found the farmers greatly appreciated having the matter called to their attention and agreed to sell the infested wheat for milling purposes and to buy clean wheat for seed.

"In the spring of 1927, a case of nematode infestation was found southeast of Gaithersburg, on one farm about 6 1/2 miles east of Rockville. The farm was visited on April 29 by Dr. A. G. Johnson and R. W. Leukel, of the Office of Cereal Crops and Diseases, and F. W. Oldenburg and Dr. R. A. Jehle, of the Extension Service, University of Maryland, together with O. W. Anderson, County Agent of Montgomery County. Two fields of wheat, totaling 38 acres, were found heavily infested with the nematode. Approximately 40 per cent of the wheat plants were found to be infected. On examination of some of the unused wheat seed it was found that it contained about three per cent (by count) of nematode galls.

"The loss that will be sustained this year on this farm is estimated at from eight to ten bushels per acre, or a total of nearly 400 bushels."

OTHER DISEASES

Bacterium atrofaciens McCul. (Phytononas atrofaciens (McCul.) Comm. S.A.B.), basal glume rot. Scattered occurrences noted in Pennsylvania, trace loss. In Illinois more than usual was noted occurring generally over the southern half of the state. In one field 7.6 per cent of the spikelets on 71.4 per cent of the heads, or 5.4 per cent of the spikelets in the field, were infected. The loss for the state was only a trace.

Fusarium culmorum leteius Sherb., seedling blight. General in California, according to Mackie.

Heterosporium spp. causing a sooty mold of the heads, reported by Heald from Washington.

Hormodendrum cladosporioides Sacc., a sooty mold of heads. Occurred in California in coastal areas to the crest of the Coast Range, according to Mackie.

Typhula graminum Karst. (Sclerotium rhizodes Auer.) Reported from Idaho.

"Occurs early in spring when snow remains late in spring. Noted in wheat only in Fremont and Teton Counties at altitudes of 5,500 feet and above." (Hungerford)

Wheat - Other Disease

Crinkle joint (undet.) Specimens received from L. W. Osborn of Oklahoma. It occurred in many fields in Tillman County.

Distortion of heads (undet.) Specimens of White Winter wheat affected with the same disease as was reported last year (Pl. Dis. Repr. Suppl. 53: 155. Aug. 1927) were sent in from Corvallis, Oregon by S. M. Zeller.

Sterile leaf spot was reported from Montana by P. A. Young as follows:

"Three plots of Black Hull and one plot of Super Hard (closely related to Black Hull) wheat are suffering badly from a heavy infestation of a sterile leaf spot. I hope to determine the cause of this trouble, for it has been rather serious for some years. Mr. W. L. Popham, State Leader in Barberry Eradication has just returned from a trip into the western part of the state. He reports this sterile leaf spot to be present in many fields. It is interesting to note that in the Experiment Station plots of the Agronomy Department here this leaf spot occurs only in the four plots mentioned above and was absent from a plot of Kanred wheat."

Stripe (undet.) Same as usual in Pennsylvania. Very slight importance.
Terminal bleaching of leaves (undet.) Reported from Utah.

"A physiological disturbance leading to the abrupt dying and bleaching of the apical portion of the uppermost leaf or leaves has been observed in irrigated wheat in several of the northcentral counties. The cause and importance of this trouble have not been determined." (Linford)

Recent literature on miscellaneous wheat diseases

1. Russell, R. C. A nematode discovered on wheat in Saskatchewan. *Scient. Agr.* 7: 385-386. June 1927.
2. Webb, R. W. Soil factors influencing the development of the mosaic disease in winter wheat. *Jour. Agr. Res.* 35: 587-614. Oct. 1, 1927.

RYE

STEM RUST CAUSED BY PUCCINIA GRAMINIS PERS.

Traces of stem rust were reported from several of the states north of the Ohio and Missouri River Valleys. The attack was very light and the losses practically negligible. It was first observed as follows: June 20, Madison, Wisconsin; June 22, Morristown, New Jersey; July 13, Branford, Connecticut; and July 23, State College, Pennsylvania.

LEAF RUST CAUSED BY PUCCINIA DISPERSA ERIKS.

Leaf rust was reported from the majority of states where rye is grown. In general it was about the same or rather more prevalent than usual or last year and was of slight to medium importance. The losses as estimated by collaborators are given in table 81.

Rye - Leaf Rust

Table 81. Estimated percentage loss from leaf rust of rye, as estimated by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
5	Indiana	0.5	Connecticut, Ohio
1.5	South Carolina	0.2	Illinois
1	Pennsylvania	trace	New York, Virginia, Tennessee, Alabama, Mississippi, Wisconsin
	Maryland, Michigan		
	Kansas		

In Illinois one field was observed where 100 per cent of the culms and 61 per cent of the leaf area were affected.

Dates of earliest appearance are given in table 82.

Table 82. Dates and places of first observation of leaf rust on rye, 1927.

Date	Place	County	State
April 11	Clemson College	Oconee	South Carolina
17	A. & M. College	Oktibbeha	Mississippi
26	University	Ramsey	Minnesota
	Farm		
May 15	Muscatine	Muscatine	Iowa
25	Mt. Carmel	Wabash	Illinois
June 5	Madison	Dane	Wisconsin
17	Union	Tolland	Connecticut
17	State College	Center	Pennsylvania

In South Carolina, where some variety tests by the Agronomy Division were made, the variety Rosen seemed most susceptible and one of Coker's selections from Abruzzi was the least susceptible of the varieties planted. In Indiana, E. B. Mains reported certain inbred selections of Abruzzi very resistant.

ERGOT CAUSED BY CLAVICEPS PURPUREA (FR.) TUL.

Ergot was reported from Connecticut, New Jersey, Pennsylvania, Virginia, Ohio, Indiana, Illinois, Wisconsin, Minnesota, Iowa, North Dakota, and South Dakota. Reports of non-observation were received from a number of other states. Losses as estimated by collaborators are as follows: 1.5 per cent, Wisconsin and North Dakota; 0.5 per cent, Ohio and Iowa; 0.1 per cent, Indiana; and trace, Pennsylvania, Virginia, Illinois, Michigan, Minnesota, and South Dakota.

In Illinois ergot was found in only one field where 0.7 per cent of the heads averaged 4.4 per cent infected spikelets or a total loss of .03 per cent of the spikelets for the entire field. In Muscatine County, Iowa, where rye is used extensively as a cover crop for vegetables ergot was very common. In general about 10 per cent of the plants there were infected, commonly two to three sclerotia being borne on a single head.

Dates of earliest observation were: July 1, Spooner, Wisconsin; July 8, Le Sueur, Minnesota; July 28, Wahpeton, North Dakota; July 11, Hunterston, New Jersey.

POWDERY MILDEW CAUSED BY ERYsiphe GRAMINIS DC.

Very few states report any trouble from powdery mildew. The majority of states reporting mention that it was not observed. Massachusetts, New Jersey, Pennsylvania, Wisconsin, and Minnesota reported occurrence. In only one state was there evidence of much damage and this was in Massachusetts where W. H. Davis stated that in some orchards where rye was used for a cover crop as many as one-third of the leaves were killed by mildew.

STEM SMUT CAUSED BY UROCYSTIS OCCULTA (WALLR.) RABH.

Stem smut was reported only rarely in 1927. The only reports to the Survey were Pennsylvania (0.5 per cent loss); Wisconsin (trace); Minnesota (trace); and Iowa (trace). In the latter state smut was observed occurring abundantly in rye used as a cover crop for vegetables. One field showed 50 per cent infected plants and other fields showed as high as 10 per cent. July 10 at White Bear, Minnesota, and July 10, at Spooner, Wisconsin, were two dates of earliest observation submitted.

OTHER DISEASES

Gibberella saubinetii (Mont.) Sacc., scab. Traces of this disease were observed in Pennsylvania, Maryland, Wisconsin, and Missouri. In the latter state, according to I. T. Scott, it was found in two fields as a seedling blight rather than as an infection of the heads. About 2 per cent of the plants were infected and although they recovered partly they developed little or no grain.

Septoria secalis Prill. & Del., leaf blotch. Two states, Illinois and Iowa, reported this disease. In Illinois, according to Stout, it was only found once during the year. Three culms in one field showed one infected leaf each. In Iowa, however, this disease was general and severely attacked the leaves on the lower half of the plants often killing them and giving the fields a brownish color. Although this disease has doubtless occurred in Iowa many times before this seems to be the first official report of it from that state to the Plant Disease Survey.

Septoria sp. Traces reported from Sacramento Valley of California. (Mackie)

Tilletia laevis Kühn. bunt. In Kansas several thousand heads of rye grown from seed heavily inoculated with bunt were examined and three heads were found which were bunted. The rye was a mixture in badly smutted wheat seed and wheat plants grown from that seed were heavily smutted. (C. O. Johnston)

Ustilago tritici (Pers.) Rostr., head smut. Because of its rarity this disease is more or less a curiosity. It has been reported from several states from time to time in very small amounts. The only state reporting it in 1927 was Massachusetts where one specimen was found in a stool of volunteer rye near a wood. This seems to be the first report from Massachusetts.

Recent literature

1. Flachs. Aplanobacter Rathayi E. F. S. an Roggen. Illustr. Landw. Zeit. 47: 262. May 1927.
2. Zimmermann, F. Zur Bekämpfung der Fusariose des Roggens mit Trockenbeizmitteln. Zeitschr. Pflanzenkr. 37: 163-172. 1927.

BARLEYCOVERED SMUT CAUSED BY *USTILAGO HORDEI* (PERS.) KELL. & SW.

According to collaborators this smut, which is widely distributed over the country, occurred in about the usual amounts.

Table 83. Estimated percentage loss from covered smut of barley as estimated by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
6	: Colorado	1	: New York, Maryland,
4	: Montana		: Iowa, North Dakota
3	: Tennessee		: Texas, Utah, Idaho
2.5	: Virginia	0.75	: Minnesota
2	: Michigan	0.5	: Connecticut, Ohio
1.5	: Kansas		: Wisconsin
1.2	: Pennsylvania	trace	: South Dakota

In Iowa one field was found with as high as 35 per cent infected heads and in Utah, Virginia, and Minnesota, the maximum percentages were 15, 10 and 10 respectively.

C. O. Johnston makes the statement that in Kansas covered smut always occurs in greater amounts in the northwestern than in the eastern part of the state.

In California, the varieties Sacramento, California Meriout, and Lameseta showed immunity to the covered smut.

Recent literature

1. Briggs, F. N. Dehulling barley seed with sulphuric acid to induce infection with covered smut. *Jour. Agr. Res.* 35: 907-914. Nov. 15 1927.
2. Neill, J. G. Covered smut of barley and its control. *New Zealand Jour. Agr.* 34: 304-308. May 1927.
3. Porter, R. H. Seed disinfectants for the control of covered smut and stripe of hulless barley. (Abstract) *Phytopath.* 18:139. Jan. 1928.

LOOSE SMUT CAUSED BY *USTILAGO NUDA* (JENS.) KELL. & SW.

The states from which loose smut were reported are shown in the accompanying table of losses. In general collaborators state that the disease was of about the average prevalence although more occurred in Pennsylvania and North Carolina and much more was noted in Maryland.

Barley - Loose Smut

The loss estimates are as follows:

Table 84. Estimated percentage loss from loose smut of barley as estimated by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
4	Maryland	1	South Carolina,
3.4	Illinois		Michigan, North
3.3	Pennsylvania		Dakota, South Dakota,
3	Montana		Kansas
2	New York,	0.5	Connecticut, Virginia
	Tennessee		Ohio
1.5	Minnesota	trace	Wisconsin, Iowa
			Colorado, Idaho,
			California

Maximum losses of 8.5 per cent and 6.2 per cent were reported from Pennsylvania and Illinois respectively. In New York out of 40 fields inspected for certification there was an average of 1.25 per cent smut. This included both the loose and the covered smut. Since these are some of the best fields in the state the percentage of disease in them was naturally much below the state average.

The varieties Oderbrucker and Mammoth Winter were reported susceptible in Illinois and Alpha susceptible in New York and Pennsylvania.

A few hot water seed treatment demonstrations were conducted in New York with successful results. Six fields planted with Featherston (six-row) barley, the seed of which last year had 10 per cent smut and which this year was treated with wet formaldehyde, showed the following percentages of smut: 1.1, 1.4, 1.5, 2.5, and 3.

Recent literature

1. Tisdale, W. H., and M. A. Griffiths. Strains of *Ustilago nuda* and certain host relationships. (Abstract) *Phytopath.* 17: 42. 1927.
2. Variants in *Ustilago nuda* and certain host relationships. *Jour. Agr. Res.* 34: 993-1000. June 1, 1927.

STEM RUST CAUSED BY *PUCCINIA GRAMINIS* PERS.

This disease was reported from the states given in the accompanying table of losses. Illinois, Minnesota, and North Dakota reported more than the usual amount in barley. The other states reported about the same.

Barley - Stem Rust

Table 85. Estimated percentage loss from stem rust of barley as estimated by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
2	North Dakota	trace	New York, Pennsylvania
1.5	South Dakota		Maryland, Illinois,
1	Ohio		Minnesota, Iowa,
0.5	Wisconsin		Kansas, Colorado,
			Utah, Idaho
			California

Dates of earliest report of stem rust on barley were July 16, Clarion, Pennsylvania; July 23, Carroll Co., Illinois; June 26, St. Peter, Minnesota.

LEAF RUST CAUSED BY *PUCCINIA ANOMALA* ROSTR.

Leaf rust occurred rather generally although sparingly in barley fields east of the Great Plains and in California. It was more abundant in Illinois than usual and much more prevalent in Minnesota and Kansas than during average years. Only very slight losses occurred, however. They have been estimated by collaborators as follows: 1 per cent, Michigan; 0.6 per cent Illinois; 0.5 per cent, Ohio; and a trace each in New York, Pennsylvania, Maryland, Virginia, West Virginia, Tennessee, Minnesota, South Dakota, and Kansas.

Dates of earliest observation as reported to the Survey were June 26, St. Peter, Minnesota; June 30, Reading, Pennsylvania; July 23, Carroll Co., Illinois; and May 5, Blacksburg, Virginia. In Kansas, the variety Tennessee Winter was mentioned as especially susceptible. In Illinois leaf rust was observed only on Oderbrucker and in California the variety Sacramento was reported not attacked.

STRIFE CAUSED BY *HELMINTHOSPORIUM GRAMINEUM* RABH.

The states listed in the following table reported this disease in 1927.

Table 86. Estimated percentage loss from stripe of barley as estimated by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
4.8	Utah		South Carolina,
3	Tennessee,		North Dakota, South
	Colorado		Dakota
2.7	Illinois	trace	Maryland, Virginia
2	Wisconsin, Iowa	no loss	Texas, Oklahoma,
1	Pennsylvania,		Arizona, California
	North Carolina,		

In Wisconsin, Leukel and Dickson inspected about 75 barley fields comprising over 3,000 acres July 19 and 20. They found stripe occurring as a mere trace in a majority of fields, 2 to 6 per cent in about one-third of the fields, and 10 and 15 per cent in six fields. One field near Pardeeville had 20 per cent stripe. In Pennsylvania the disease was the worst that it has been noted during

recent years. It was seen in 75 per cent of the fields surveyed.

In Iowa, counts of infection were made in three experimental plots in different parts of the state. Among the varieties most susceptible in these plots were: Minsturdi, Manchuria (Iowa), and Caucasian, while some which showed resistance were Horn, Featherston, Bonami, Sandrel, Trebi CI 936, and Oderbrucker. In California, Mackie reports that the barleys most affected are the new variety Atlas, which was badly attacked everywhere, Coast and 4,000, related varieties.

Recent literature

1. Leukel, R. W., J. G. Dickson, and A. G. Johnson. Experiments with dusts for controlling stripe disease of barley. *Phytopath.* 17: 175-179. 1927.
2. Porter, R. H. Seed disinfectants for the control of covered smut and stripe of hulless barley. (Abstract) *Phytopath.* 18: 139. Jan. 1928.

SPOT BLOTH CAUSED BY *HELMINTHOSPORIUM SATIVUM* PAM., KING, AND BAK.

The only states reporting this disease were Pennsylvania, Texas, Iowa, North Dakota, Kansas, Idaho, and California. It was apparently of very slight importance except in California where, according to Mackie, it was the worst barley disease of the year causing shriveling and reduction in grade of the grain. Much seedling injury (25 to 30 per cent of the crop) was reported from the coastal areas of California.

NET BLOTH CAUSED BY *PYRENOPHORA TERES* (DIED.) DRECHS.

New York, Maryland, Wisconsin, Minnesota, Iowa, Idaho, and California were the only states reporting this disease in 1927. The most loss was reported from Iowa where 2 per cent reduction in yield was estimated. It also caused a considerable reduction in leaf area throughout the barley areas of California on early sown barley. The variety Sacramento was not injured according to Mackie in California. In Iowa counts in three barley plots showed that Colsess, Trebi (Colorado), Trebi C I 936, and Sandrel showed extremely high infection when compared with other varieties.

Helminthosporium californicum Mackie & Paxton, sooty blotch. Of much importance in California causing premature ripening and seed shriveling. (Mackie)

Rhynchosporium secalis (Oud.) Davis, scald. Wisconsin and California are the only states reporting this in 1927. In the latter state, according to Mackie it is of much importance causing much damage in early sown grain on summer fallow. The variety Sacramento appears to be less injured than other varieties.

Gibberella saubinetii (Mont.) Sacc., scab. Traces were reported on barley in Pennsylvania, Ohio, Tennessee, Wisconsin, and Iowa. In all cases the losses were practically negligible.

Claviceps purpurea (Fr.) Tul., ergot. A few collections on barley were made in Illinois, Wisconsin, Minnesota, and North Dakota.

Colletotrichum graminicolum (Ces.) Wils., anthracnose. Only two states, Pennsylvania and Wisconsin, reported anthracnose. In Pennsylvania more was found than last year although the total loss was only a trace. One field showed 5 per cent infection according to Kirby.

Erysiphe graminis DC., powdery mildew. Several states reported the prevalence of this disease but California seems to be the only one that reported much damage. In that state it severely injured late sown barley both on the coast and in the interior valleys. The variety Sacramento seemed to be entirely immune to the disease, according to Mackie.

Bacterium translucens Jones, Johnson & Reddy, bacterial blight. Texas, Wisconsin, Iowa, and Utah reported bacterial blight. In the latter state it was reported to the Survey for the first time, it being found in 5 fields in the same number of counties. In one field there was only a trace but in each of the other losses of 4, 30, 75, and 95 per cent were estimated respectively. If these fields were representative of the entire state the average loss on account of the trouble would be about 4 per cent. It is suspected, however, that these fields are not representative for the entire state and that the state average loss will probably be nearer 0.5 per cent.

Ophiobolus graminis Sacc., take all. Was again prevalent in California, according to Mackie, but causing less damage than for the past few years. Considerable varietal resistance has been noted in barley.

Fusarium culmorum leteius Sherb., root rot. General in California but worse along the coast.

Scolecotrichum graminis Fckl. Collected in Utah, July 19, by M. B. Linford.

Recent literature

1. Eversmann, G. A. A., and J. H. Aberson. Weitere Untersuchungen über die Dörrfleckenkrankheit. Landw. Jahrb. 65: 649-673. 1927.
2. Lebedeva, Mme L. A. (A fungus of the genus Marssonnia parasitic on barley.) Abs. in Ann. State. Inst. of Exper. Agron., Leningrad, 5: 200. 1927.

SMUT CAUSED BY USTILAGO AVENAE (PERS.) JENS. AND U. LEVIS (K. & S.) Mag.

Considering the fact that the seed treatment method for controlling the oat smuts is so efficient, inexpensive, and so well known, it is somewhat surprising that more farmers did not take advantage of this method and prevent some of the losses, which were particularly high in 1927. In some of the states oat smut was outstanding in its importance. This applies particularly to North and South Carolina where reductions in yield of 20 and 35 per cent were estimated respectively. Concerning the situation in the former state, G. W. Fant writes:

"A severe outbreak of oats smut occurred in 1927. Fall sown oats were more severely affected than spring sown. Infection running as high as 60 per cent was of fairly common occurrence this year."

In South Carolina, W. D. Moore states:

"Heaviest infection in history of state so far as available records show. Many fields running about 90 per cent infection. The average for all counties in eastern half of state is about 38 per cent. Almost 100 per cent control in the few instances where seed was treated."

In Pennsylvania also an unusually high loss occurred. Nine per cent was the estimated state average loss and maximums of as high as 51, 41, and 33 per cent were noted in individual fields. Other maximum losses reported were: 60 per cent, Minnesota; 50 per cent, Missouri and Arizona; 40 per cent, Colorado; 31.5 per cent, Illinois; and 23 per cent, Iowa.

Table 87. Estimated percentage loss from oats smut as reported by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
35	South Carolina	4	Minnesota, Montana
20	North Carolina	3	Virginia, Michigan,
9	Pennsylvania		Wisconsin, Iowa,
7.6	Utah		South Dakota,
5.5	Ohio		Mississippi
5	New York, Maryland,	2.5	Florida
	West Virginia, Georgia,	2	Maine, Massachusetts,
	Missouri, Tennessee		North Dakota, Texas
	Colorado	1.5	Connecticut, New Jersey
4.8	Illinois		Idaho
		trace	Delaware, Louisiana

The varieties Kanota and Fulghum were resistant in northern Kansas while Kanota was susceptible in southeastern Kansas. This is explained by C. O. Johnston as possibly being due to a difference in the form of smut in the two localities of the state. In California, Mackie reports that Kanota is now replacing all other varieties as it is practically immune to the form of smut in that state and because of this it is not necessary to treat the seed.

Heald reports *U. levis* in eastern Washington and *U. avenae* as a prevalent form west of the Cascades.

In Ohio, two new dust treatments of oat smuts have been reported by Sayre and Thomas (6,7,8). Both of these give excellent results. One is formaldehyde dust made by mixing formaldehyde with infusorial earth. The other is iodine dust made by mixing finely ground iodine with infusorial earth. The iodine dust is also reported by Vaughan as giving good results in Wisconsin.

Recent literature

1. Gage, G. R. Studies of the life history of *Ustilago avenae* (Pers.) Jensen and of *Ustilago levis* (Kell. & Swing.) Magn. New York (Cornell) Agr. Exp. Stat. Mem. 109. 35 p. July 1927.
2. Dickinson, Sydney. Experiments on the physiology and genetics of the smut fungi. Seedling infection. Proc. Roy. Soc. Ser. B. 102: 174-176.
3. Johnston, C. O. Effects of soil moisture and temperature and of dehulling on the infection of oats by loose and covered smuts. Phytopath. 17: 31-36. 1927.
4. Raeder, J. M., and C. W. Hungerford. Dust treatments for the control of oat smut in Idaho. Phytopath. 17: 569-570. Aug. 1927.
5. Reed, G. M. Further evidence of physiologic races of oat smuts. Mycologia 14: 21-28. 1927.
6. Sayre, J. D., and R. C. Thomas. New dust treatments for oat smuts. Science n.s. 66: 398. Oct. 28, 1927.
7. _____ New dust treatments for oat smuts. (Abstract) Phytopath. 18: 139. 1928.
8. _____ Formaldehyde and iodine dusts for the control of oat smut. Ohio Agr. Exp. Sta. Bi-month. Bull. 13: 19-21. Jan.-Feb. 1928.

STEM RUST CAUSED BY PUCCINIA GRAMINIS PERS.

As in the case of stem rust of wheat this disease on oats was unusually prevalent in the spring wheat area, Minnesota and the Dakotas, where it assumed epidemic proportions. It was also worse in Nebraska and Kansas. Most of the

states reported about the usual amounts.

Early oats for the most part escaped but late oats suffered, in some cases very severely. In Illinois, Stout estimated about 3.4 per cent infection on early oats as compared with about 9.6 per cent on late oats. The situation was complicated with crown rust and weather conditions, the two diseases and the weather bringing about almost complete failure in many cases. In making estimates of losses it has been found very difficult to separate the damage caused by the two rusts.

Table 88. Estimated percentage loss from stem rust of oats as reported by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
15	: Minnesota	:: 0.5	: Ohio, Wisconsin
12	: South Dakota	:: trace	: New York, Maryland
5	: North Dakota	::	: West Virginia, Illinois
2	: Michigan	::	: Missouri, Nebraska
1	: Pennsylvania	::	: Kansas, Wyoming, Colorado,
0.8	: Iowa	::	: Idaho

In Minnesota, the variety Anthony was reported as highly resistant (1).

Recent literature

1. Torrey, E. C. New plant varieties in Minnesota. *Seed World* 22 (10): 7-8. Nov. 4, 1927.

CROWN RUST CAUSED BY PUCCINIA CORONATA CDA.

In general crown rust was worse than usual throughout the central states from Georgia and Louisiana northward to Indiana and North Dakota. In Minnesota and Kansas it was said to have been the heaviest infection on record and in Idaho it was noted this year for the first time. In Virginia, it caused practical failures of the oat crop in Surry and Fairfax Counties.

Of the 33 states reporting this disease in 1927 about one-half of them reported more than usual. The other half reported either the same, less, or did not mention the prevalence.

Table 89. Estimated percentage loss from crown rust of oats as reported by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
25	: Tennessee	:: 2	: Iowa
20	: Louisiana	:: 1	: Pennsylvania,
15	: Minnesota, Florida	::	: Georgia, Michigan,
12	: Mississippi	::	: Wisconsin
5	: Indiana, Nebraska	:: 0.5	: New York, Virginia
	: Kansas	::	: Ohio
3	: Texas, North Dakota	:: trace	: Maryland, West
		::	: Virginia, Idaho

The variety Texas Red Rust Proof was said to be very susceptible in Georgia by Boyd. It was also heavily infected in Mississippi. Fulghum was noted as resistant in Virginia. The variety Lee was susceptible in Arkansas.

Dietz and Leach (1) have reported four effective methods of eradicating the alternate host of this rust - (1) Application of salt, (2) Application of kerosene, (3) Removal of top growth and application of salt, and (4) Removal of crown.

Recent literature

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2. Parson, H. E. Physiologic specialization in *Puccinia coronata* *avenae*. *Phytopath.* 17: 783-790. Nov. 1927.
3. Ruttle, M. L., and W. P. Fraser. A cytological study of *Puccinia coronata* Cda. on Banner and Cowra 35 oats. *Univ. Calif. Publ. Bot.* 14: 21-54; 1927.

BLAST OR STERILITY (UNDET.)

Illinois, Missouri, Kansas, and North Dakota reported more sterility than last year. In Illinois it was rated as the worst disease of oats. In Pennsylvania it was the second most important trouble, being exceeded only by smut. In Kansas it ranked alongside of crown rust in importance. Percentage losses were estimated as follows: 7.6, Illinois; 5, Minnesota and Kansas; 1.5 Pennsylvania; 1, New York and South Dakota; 0.5, Missouri.

In Illinois a loss of 29.7 per cent was noted in one field. This means that 33 per cent of the spiklets on 90.2 per cent of the panicles were blasted. In Arkansas sterility was noted on a number of varieties of winter oats. Among these varieties were some of the Arkansas selections and Kanota. In Kansas, Kanota seemed to be resistant while Red Texas and White oats were severely attacked. Kanota was also highly resistant in California and is replacing the Red Texas which is highly susceptible.

BACTERIAL STRIPE BLIGHT CAUSED BY BACTERIUM STRIAFACIENS ELLIOTT

Charlotte Elliott (1) has described the organism causing the bacterial stripe blight of oats, which occurs widely throughout the country. It has been collected in Ohio, Indiana, Illinois, Wisconsin, Minnesota, North and South Dakota, and the Pacific Coast States.

Recent literature

1. Elliott, Charlotte. Bacterial stripe blight of oats. *Jour. Agr. Res.* 35: 811-824, Nov. 1, 1927.

SMUT CAUSED BY USTILAGO ZEAE (BECKM.) UNG.

About the average amount of corn smut occurred in 1927, although Massachusetts, Florida, Ohio, and Colorado reported somewhat more than usual. Much less than the average amount was noted in Illinois.

Table 90. Estimated percentage loss from corn smut as reported by collaborators, 1927.

Percentage loss	States reporting	Percentage loss	States reporting
4	North Dakota, Kansas	1	New York, New Jersey,
3	Pennsylvania, Ohio		West Virginia, South
	Iowa		Carolina, Tennessee,
2.5	Connecticut, North		Texas
	Carolina	0.7	Minnesota
2	Florida, Missouri	0.5	Massachusetts, Delaware,
1.5	Wisconsin		Maryland
		0.2	Indiana, Illinois

Maximum percentages of infected stalks found in fields were: Minnesota, 66 (sweet corn); Iowa, 39; Arizona, 27; Pennsylvania, 20; Missouri, 15; Illinois, 10.4 and North Dakota, 10.

Percentages of infection were generally higher in sweet corn than in field corn. In New York, 2 to 3 per cent loss was estimated for this crop; in Minnesota, 2 per cent; and in Iowa, 7.5 per cent. Popcorn was mentioned as especially susceptible in Iowa and as it is an important crop there the loss was considerable amounting to about 4 per cent. One field of popcorn was seen with 9 per cent of the ears infected. As usual considerable difference in susceptibility was noted in different lines of corn.

In Illinois, the Natural History Survey has been collecting data on the prevalence and destructiveness of corn smut for the past six years and G. L. Stout has furnished a table with accompanying data giving the results of the six-year survey (table 91). The counties included in the survey were distributed over the state with the exception of the years 1922 and 1927 when northern counties and the southern three-fifths of the state were inspected respectively. The inspection periods were: July 21 to August 15, 1922; July 17 to September 5, 1923; August 4 to September 22, 1924; July 17 to October 28, 1925; July 10 to November 18, 1926; July 22 to November 10, 1927.

Table 91. Summary of data on corn smut by years and for the six year period.

Year	Fields examined	Counties represented	acres	: Average per cent:		Per cent of infested plants showing ear loss
				Total examined	per cent of ears defected	
1922	7	4	105	4.2	1.0	23.8
1923	19	12	593	6.8	3.0	44.1
1924	117	57	4,402	5.5	1.9	34.5
1925	23	21	565	3.0	0.1	3.3
1926	84	70	1,569	2.9	1.8	62.0
1927	49	40	935	1.3	0.2	15.3
Total						
6 yrs.	299		8,169			
Av.						
6 yrs	49.8	34	1,361.5	3.9	1.3	33.3

EAR ROT CAUSED BY DIPLODIA ZEAE LÉV.

Although Diplodia acts as a root and stalk rot as well as an ear rot the following brief statement applies to the ear rot phase only. In 1927 Diplodia ear rot was reported rather widely over the eastern half of the country. Estimates of losses, however, were received from only a comparatively small number of states, as follows: 3 per cent, Maryland and Kansas; 2.5 per cent, Indiana; 2 per cent, Iowa; 1 per cent, Ohio, North Carolina, and South Dakota; 0.5 per cent, Delaware; and 0.3 per cent, Pennsylvania.

Most of the states reporting mentioned less than the usual amount of ear rot from this fungus and several of them mentioned that the dry, summery weather of October which permitted corn to mature properly had considerable to do with this. In New Jersey, numerous isolations from rotted ears showed no Diplodia whatever but only Fusarium and Cephalosporium. In Iowa, where this ear rot is quite destructive it assumed a minor role when compared with *Basisporium* rot.

In Indiana, two strains of Butler corn are reported as resistant by R. R. St. John.

ROOT, STALK, AND EAR ROTS ASSOCIATED WITH GIBBERELLA,
FUSARIUM, AND OTHER FUNGI.

The root, stalk and ear rot problem is very complicated owing to the many factors concerned. Among these factors may be mentioned unbalanced fertility, poor growing conditions, insects, and various fungi such as *Fusarium*, *Gibberella*, *Diplodia*, *Pythium*, etc. Since many of these factors are all operating at the same time it is very difficult to make any separations of these diseases on the basis of cause. In Iowa and Kansas last year considerable root rot accompanied by lodging of the corn followed primary injury from corn root worm. In Missouri, a *Pythium* was repeatedly isolated from decaying roots. Koehler, Dungan and Holbert (3) have reported that during the years 1924-26 more than 400 bushels of a yellow dent corn showed ear rot losses proportioned as follows among the three important disease-producing organisms: losses from *Fusarium moniliforme*, 8.63 per cent; from *Diplodia zeae*, 12.24 per cent; and from *Gibberella saubinetii*, 14.73 per cent. Collaborators of the Plant Disease Survey were asked to estimate

losses from this group of diseases separating them into two groups, ear rots and root rots. It is realized, however, that both types of diseases may be brought about by the same causes, (table 92).

Table 92. Estimated losses from ear rot and root rot of corn as reported by collaborators, 1927.

State	Root rot	Ear rot	Total
Pennsylvania	4	5.3	9.3
Delaware	trace	1	1+
Maryland	10	4.5	14.5
Virginia	3	3	6
West Virginia	2	1	3
North Carolina	3	2	5
Ohio	0.5	1	1.5
Indiana	3	3	6
Illinois	-	-	3.5
Wisconsin	-	3	3
Iowa	0	7	7
Missouri	3.5	2	5.5
North Dakota	trace	trace	trace
South Dakota	2	1	3
Kansas	8	6	14
Tennessee	5	2	7
Mississippi	11	1	12
Louisiana	-	10	10
Montana	2	-	2
Idaho	trace	trace	trace

Practically all of the states agree that the ear rots were less prevalent than usual. The majority of states also reported less than the average amount of root rot.

Recent literature

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RUST CAUSED BY PUCCINIA SORGI SCHW.

This rust occurred widely. It is known to occur in all states except some of those in the Rocky Mountain area, namely Montana, Wyoming, Utah, Arizona, Nevada, Idaho, Washington, and Arizona. This year for the first time apparently it was collected in Utah where M. B. Linford found what appeared to be a single uredinium of this rust on one leaf in one field.

More than the average amount was reported from Massachusetts, West Virginia, Illinois, Missouri, and Kansas. In the latter state it assumed epidemic proportions on both field and sweet corn. C. O. Johnston reported the heaviest infection that he has ever seen. Many leaves dried up prematurely especially toward the end of the season. In spite of this outbreak, however, he estimates the loss for Kansas as only a trace. Loss for the United States was very slight as the disease usually comes on late and is ordinarily not severe. However, a loss of 2 per cent was reported on sweet corn in Iowa. Dates of earliest appearance were reported as follows: Amherst, Massachusetts, September 2; Manchester, Ohio, August 4; University Farm, Minnesota, July 11 (sweet corn), July 16 (field corn); Lucas, Iowa, August 4.

Some inbred lines are reported resistant in Indiana by Mains (1). He also reports the presence of physiologic forms of the rust with the consequent resistance of some varieties to one form and their susceptibility to others.

Recent literature

1. Mains, E. B. Inheritance of resistance to *Puccinia sorghi* in maize. (Abstract) *Phytopath.* 18: 138. 1928.
2. Wellensiek, S. J. The nature of resistance in *Zea mays* L. to *Puccinia sorghi* Schw. *Phytopath.* 17: 815-825. Dec. 1927.

BACTERIAL WILT CAUSED BY *AFLANOBACTER STEWARTII* (EFS.) McCUL.

Only eight states, Massachusetts, New Jersey, Maryland, Virginia, West Virginia, Ohio, Illinois, and Indiana, reported the presence of this disease, usually in rather small quantities. Collaborators in Ohio estimated that as much as 1 per cent of the sweet corn crop was lost while those from other states did not report more than a trace. Dates of first observation were: September 7, Amherst, Mass; August 3, New Brunswick, New Jersey; and June 15, Lafayette, Indiana. As usual the Golden Bantam seemed to be the most commonly and severely attacked.

BROWN SPOT CAUSED BY *PHYSODERMA ZEAE-MAYDIS* SHAW

Nine states reported the occurrence of brown spot in 1927, Tennessee, North Carolina, South Carolina, Georgia, Florida, Mississippi, Louisiana, Illinois, and Kansas. Georgia with 1 per cent was the only state estimating the loss as over a trace and Louisiana was the only state that reported more than usual prevalence. June 9 at Tifton, Georgia, July 1 at Sartaria, Mississippi, and August 4 at Manchester, Illinois, were the dates of earliest reports. During 1927 an old specimen of this disease collected in July, 1898, at Arcadia, Louisiana, was found among undetermined specimens in the Mycological Herbarium, Bureau of Plant Industry. Prior to this finding the earliest collection had been considered as that of E. C. Johnson from Atlanta, Georgia, September 10, 1910.

OTHER DISEASES

Phytomonas dissolvers(Rosen) Comm. S.A.B., stalk rot. Reported from Louisiana where E. C. Tims stated that a very severe outbreak occurred on one plantation causing from 10 to 40 per cent loss. A bacterial stalk rot is also becoming more prevalent in Mississippi, according to Neal. In Missouri, one case of root and stalk rot caused by an undetermined bacterium with 10 per cent of the plants affected was reported. A bacterium was isolated but not definitely identified.

Basisporium gallarum Moll., ear rot. Wisconsin, Iowa, and Missouri reported trouble from this fungus. In Iowa, a 4 per cent loss or more than half the loss from all ear rots was estimated. In Missouri, only a small percentage of the corn in one field was noted as affected with this disease. In Wisconsin, 2 per cent loss was estimated and the disease appeared to be general.

Cephalosporium acremonium Cda., black bundle. This fungus was the cause of considerable loss in a number of states as follows: Pennsylvania, 1 per cent; Illinois, 2.2 per cent; Wisconsin, 6 per cent; and Iowa, 0.5 per cent. It was also reported from Montana apparently for the first time. Although it has undoubtedly occurred in Iowa for a more or less indefinite period this is the first report to the Plant Disease Survey. In Wisconsin, as high as 12 per cent infection was noted in one case and the statement is made by the collaborator, R. E. Vaughan, that not enough attention is being paid to this disease. An infection of 7.2 per cent was observed in Illinois and 7 per cent in Pennsylvania.

Mosaic (undet.) Generally distributed in southern Louisiana but causing little damage according to E. C. Tims. Stoneberg (9) studied this disease in Indiana comparing diseased plants with healthy ones and found that the yield from diseased plants was only about 10 per cent less than the yield from healthy plants. On the basis of his data he concludes that this disease was only slightly deleterious to the yield and quality of corn in that state.

Ophiobolus heterostrophus Drechs; foot rot. Lafayette, Indiana, June 23. (Trost)

Pseudomonas holci Kend., bacterial spot. Occurred generally in Iowa causing some damage. A bacterial leafspot of undetermined cause reported by Taubenhaus in Texas.

Rhizopus sp., scutellum rot. More than usual in Minnesota. Extremely moist weather retarded germination and favored this rot.

Sclerospora graminicola (Sacc.) Schröt., downy mildew. Iowa - Observed abundantly on Setaria and in one instance on Golden Bantam sweet corn.

Sorosporium reilianum (Kühn) McAlp., head smut. Reported only from Idaho.

Sheath spot. (Fusaria and other fungi) Although undoubtedly common in many states the only actual report to the Survey was from Utah where it was observed occurring very widely but doing little if any damage.

Recent literature

1. Bertus, L. S. A sclerotial disease of maize (*Zea mays* L.) due to *Rhizoctonia solani* Kühn. Yearbk. Dept. Agr. Ceylon 1927: 44-46. 1927.
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RICE

Piricularia oryzae Br. & Cav., blast. Traces noted in Florida, Louisiana, Texas, and Arkansas. No estimate of any particular damage was received.

Sclerotium oryzae Catt., stem rot. Reported only from Arkansas where it was more prevalent than usual. According to V. H. Young this is the most important rice disease in the state and is spreading slowly.

Straight head, undet. Reported from Texas and Arkansas. In the former state Taubenhaus estimates a 2 per cent loss and in Arkansas V. H. Young says that it is common on new land or when much vegetable matter is turned under with no opportunity for decay.

Tilletia horrida Tak., smut. Arkansas is the only state reporting this smut. Never more than a trace was found. Many samples showed a few spores in washings. It has been seen on long- and short-grained types, the long-grained being most susceptible. The variety Fortuna seemed to be most susceptible.

Recent literature

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2. Nisikado, Yosikazu. Comparative studies on Helminthosporium diseases of rice in the Pacific regions. Ber. Ohara Inst. Landw. Forsch. 3: 425-440. 1927.
3. Studies on the rice blast disease. Japanese Jour. Bot. 3: 239-244. 1927.

FLAX

Fusarium lini Bolley, wilt. Wisconsin, Minnesota, Iowa, North Dakota, and South Dakota. It apparently occurred in about the same amounts as usual. The use of resistant varieties has greatly reduced destructiveness. In Iowa, according to Archer, the flax production which 20 years ago was considerable has dwindled to practically nothing until recent years when wilt resistant varieties were introduced. Now the acreage is on the increase. In some fields where resistant seed was not planted 50 per cent loss was observed. The loss in Wisconsin is estimated as a trace; Minnesota, 0.5 per cent; Iowa, 5 per cent; North Dakota, 10 per cent; and South Dakota, 1 per cent.

Melampsora lini (Pers.) Desm., rust. Wisconsin, Minnesota, North Dakota, and South Dakota. More than usual was reported from Minnesota and much more than usual from North Dakota. The other two states reported about the average amount. Losses were a trace in all of the states except North Dakota which reported 3 per cent. As high as 30 per cent loss was experienced by some growers in North Dakota.

It may be of interest to know that this rust was reported from New Zealand for the first time in 1926 (Cunningham 2). The crop is becoming widely grown there and this rust may prove to be a troublesome disease.

Canker (non-par.) North Dakota and South Dakota are the only states reporting this canker ordinarily attributed to heat. In North Dakota about the usual amount occurred and probably caused a loss of 3 per cent, according to W. E. Brentzel. In South Dakota, the loss was estimated as a trace.

Phlyctaena linicola Speg., pasmo. Minnesota and North Dakota reported traces with no particular damage.

Recent literature

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2. Cunningham, G. H. Fifth supplement to the Uredinales and Ustilaginales of New Zealand. *Trans. & Proc. New Zealand Inst.* 58: 47-50. Aug. 1927.
3. Hiratsuka, N. Studies on the flax rust. Reprinted from *Jour. Soc. Agr. & For. Sapporo, Japan* 19 (83): 76-92. May, 1927.
4. Salmon, E. S., and W. M. Ware. The powdery mildew of flax. *Gard. Chron.* III, 82: 34-35. 1927.

S O R G H U M

Bacterium andropogoni EFS., stripe. Reported from Texas and Kansas. In the latter state it was said to be very common, especially on certain varieties such as Feterita, Kansas Orange, and hybrids of these two varieties. Milos and kafirs were either free from the disease or only lightly attacked, according to C. O. Johnston.

Cercospora sp. Reported from Arkansas apparently for the first time.

Mosaic (undet.) Noted in southern Louisiana in at least three parishes. First observation June 27 at Raceland.

Pseudomonas holci Kend., Holcus spot. Iowa - one plant showed 50 per cent of plants with slight infection.

Puccinia purpurea Oke., rust. Indiana, Missouri, and Kansas reported the disease for the first time to the Survey. In Indiana it was found on the variety known as Segrain, seed of which was imported from Texas. In Missouri it was collected in two places, one infection was very severe. In Kansas, according to C. O. Johnston, it was very prevalent on lower leaves of sorghums in the vicinity of Manhattan. Feteritas seemed to be particularly susceptible and many of the leaves dried up prematurely on account of rust.

Sphacelotheca cruenta (Kühn) Potter, loose kernel smut. Texas and Louisiana. In both states it seemed to be of moderate importance.

Sphacelotheca sorghi (Lk.) Clint., covered kernel smut. Texas (prevalent), Colorado (very abundant, considerable damage), California (general, but less than formerly because of use of Heilman milo which has been immune until recently when slight attacks were noted.) Tisdale, Melchers, and Clemmer (5) have recently reported physiologic strains of this smut, one of which is pathogenic to milo, White Yolo, and hegari (sorghums hitherto resistant) as well as to sorghums susceptible to the ordinary covered kernel smut.

Sorosporium reilianum (Kühn) McAlp., head smut. Texas, Kansas, Utah, California. In Kansas it occurred particularly in the western half of the state in small amounts on certain varieties. It was found this year at Manhattan, where it usually does not occur, in promising Blackhull Kafir x Sourless hybrids. In general this smut was unimportant in the places from which it was reported.

Sorghum - Diseases

Bacterial disease (undet.) Kansas - "An undetermined bacterial disease was found killing milo plants in plots at the Garden City Substation by J. H. Martin, H. N. Vinall and J. H. Parker. Diseased plants were dwarfed and badly discolored and often rotted at the crown. The discolored vascular system is very noticeable. Other varieties of sorghum do not seem to be attacked." (C. O. Johnston)

Recent literature

1. Geschele, E. Biologie of *Ustilago reiliiana* Kühn. *Bolezni Rast.* (Morbi Plant.) 16: 150-155. 1927.
2. Kamat, M. N. Effect of germisan in the control of grain smut (*Sphacelotheca sorghi*) of jowar (*Andropogon sorghum*). *Poona Agr. Coll. Mag.* 19: 10-11. July 1927.
3. Martin, J. H., and G. T. Ratliffe. Loose kernel smut on feterita. *Phytopath.* 17: 338-339. 1927.
4. Reed, G. M., Marjorie Swabey, and Laura A. Kolk. Experimental studies on head smut of corn and sorghum. *Bull. Torrey Bot. Club* 54: 295-310. 1927.
5. Tisdale, W. H., L. E. Melchers, H. J. Clemmer. Strains of kernel smuts of sorghum, *Sphacelotheca sorghi* and *S. cruenta*. *Jour. Agr. Res.* 34: 825-838. 1927.

B U C K W H E A T

Mosaic-like disease. A disease showing mottling and other symptoms of mosaic was reported by Chupp from New York and the Department of Plant Pathology in New Jersey. In the former state it was observed August 29 in Schuyler County. The plants blossomed but the flowers did not produce seed. This is somewhat similar to the disease observed in New Jersey last year, according to Chupp. In that state the Department of Plant Pathology reported that the disease was observed in the same field where it was seen in 1926 but it was not so abundant.

S E S A M E (*Sesamum orientale*)

Sclerotium sp. A disease apparently caused by a species of *Sclerotium* was reported causing a trace of loss on this host in the Sacramento Valley in California by Mackie.

ALFALFALEAF SPOT CAUSED BY *PSEUDOPEZIZA MEDICAGINIS* (LIB.) SACC.

This leaf spot probably occurred in all states where alfalfa is grown. Practically all of the states reporting mentioned its general distribution. In prevalence it was about the same as usual, although Indiana, Illinois, and Missouri reported more than normal amounts. Losses were estimated as follows: Kansas, 5 per cent; Iowa, 3 per cent; Maryland and Mississippi, 1 per cent; Utah, 0.3 per cent; other states reporting a trace. The maximum period of injury varies with the season. Missouri, Kansas, and Colorado reported more damage early in the season this year while Mississippi, Louisiana, Wisconsin, and Minnesota reported damage in mid-season and in Utah late occurrence was noted. In that state the disease could be found in almost all fields examined after the middle of July. It reached its most conspicuous development in alfalfa seed fields where nearly every field was heavily infested long before the seed was mature. This resulted in early defoliation which naturally must have had some effect on the setting and maturing of the seed. Linford, who reported this, states that the effect of the disease on seed production should be investigated.

YELLOW LEAF BLOTH CAUSED BY *PYRENOPEZIZA MEDICAGINIS* FCKL.

Iowa, Kansas, and Utah were the only states reporting this disease in 1927. In Iowa, it occurred only in a few scattered localities but when it did occur it often caused severe damage. The most severe case noted showed fully one-fourth of the leaves gone from the plants with the remaining three-fourths heavily infected. The loss for the state is estimated as a trace. In Kansas, 1 per cent reduction in yield is estimated by Weimer. In Utah, Linford reported wide-spread occurrence but minor importance. Five per cent was the maximum defoliation observed. In abandoned orchards and on ditch-banks much more severe injury was noted than in cultivated fields.

LEAF AND STEM NEMATODE, *TYLENCHUS DIPSACI* (KÜHN) BAST.

M. B. McKay of Oregon was the only collaborator reporting the observation of this nematode on alfalfa in 1927. In that state it was found in a new locality on three farms in Jackson County and in general more infestation occurred in the state as a whole. The reduction in yield was estimated at 0.1 per cent and the maximum infection in any one field, 30 per cent. The disease was observed in only two areas. It may be responsible for some of the trouble attributed to winter injury in the past.

BACTERIAL ROOT ROT CAUSED BY *APLANOBACTER INSIDIOSUM* McCUL.

Ten states, Mississippi, Indiana, Michigan, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Colorado, and Utah reported the occurrence of this disease. In most of the states it seemed to be of comparatively slight importance, occurring locally for the most part, however, it may be more widespread and destructive than is realized. In Kansas, J. L. Weimer who has been studying this trouble states that it is by far the most important disease of alfalfa. It has reduced

Alfalfa - Bacterial Root Rot

many stands greatly but the exact percentage of loss is hard to estimate. In some Kansas fields, 50 per cent loss undoubtedly occurred; in others only a trace. Fifteen per cent loss for Kansas is estimated. In Missouri, much loss is being experienced because of a combination of wilt, crown rot, and root rot, the causes of which are difficult to distinguish. Isolations from many of these diseased plants have yielded Aplanobacter insidiosum. In Iowa, the disease is quite widely distributed and undoubtedly causing much damage. As high as 90 per cent infection has occurred in at least one field and the loss from bacterial root rot and crown rot together for the state was estimated at 25 per cent. Undoubtedly much of the damage from wilt has been attributed in the past to winter killing, improper soil conditions, etc. For further information on the prevalence of this disease in Iowa and Utah see Plant Disease Reporter (Supplements 58: 17-18 and 59: 70)

CROWN AND ROOT ROT PROBABLY CAUSED BY WINTER INJURY

Crown and root rots caused probably by winter injury and also associated with various fungi are responsible for much thinning out of alfalfa stands. Losses from these causes undoubtedly occurred in all the states in 1927 but were specifically reported to the Survey only from Michigan, Wisconsin, Missouri, Iowa, Kansas, and Utah. In Wisconsin, the stand of one field was reduced 25 per cent. In Kansas, 10 per cent loss for the state is estimated. In Iowa, this along with the bacterial wilt probably caused 25 per cent loss and as high as 90 per cent reduction in stand was noted. In Utah the losses were said to be very heavy.

Weimer states that in Kansas the Grinn and Kansas Common varieties seem to be about as satisfactory as any. In Iowa, Archer reports the finding of two strains of alfalfa which showed considerable resistance to winter injury. For further information concerning the situation in Iowa and Utah, see Plant Disease Reporter Supplements 58 and 59.

BACTERIAL BLIGHT CAUSED BY BACTERIUM MEDICAGINIS (SACK.)EFS.

Kentucky, Indiana, Iowa, Kansas, Colorado, Utah, Idaho, and Washington reported bacterial blight. The reports from Kentucky and Iowa seem to be the first to the Plant Disease Survey from those states. In Kansas, Weimer reported that it followed frost injury and was not important after the first cutting. The loss from the first cutting, however, was estimated at 5 per cent.

DOWNTY MILDEW CAUSED BY PERONOSPORA TRIFOLIORUM D BY.

Sixteen states reported downy mildew and of these Tennessee, Louisiana, and Indiana reported more than the usual amount. Utah was the only state reporting over a trace of loss. In that state, 1 per cent loss was estimated and losses from 2 to 5 per cent in the first cutting were frequently observed. The maximum loss observed in any one field was 15 per cent.

Alfalfa - Downy Mildew

This disease seems to be favored by cool weather and several collaborators mention its occurrence either in the early or the late parts of the season. In Wisconsin, it was quite bad during June but recovered with higher temperature and more sunlight. In Kansas, Weimer mentions that it attacks young stands especially and in Utah, Linford mentioned the most severe injury at the higher altitudes. Dates of earliest observation were: January 28, Louisiana; April 19, Seymour, Indiana; May 3, Montgomery County, Iowa; May 19, New Jersey; June 1, Madison, Wisconsin; June 7, Stillwater, Oklahoma.

OTHER DISEASES

Ascochyta medicaginis Pk., leaf spot. New York and Utah. In the latter state two types of leaf spot apparently caused by Ascochyta were observed by Linford.

Bacterial leaf spot (undet.) This seems to be an undescribed disease.

Cercospora medicaginis Ell. Ev., leaf spot. Texas and Utah.

Cuscuta sp., dodder. Texas, New Mexico and Utah. Some fields suffered severely.

Fusarium sp., root rot. Virginia, Mississippi and Missouri. Confused with bacterial wilt and winter injury.

Caconema radicicola (Greef) Cobb, root knot. Important where Hairy Peruvian variety is not grown.

Macrosporium sp., leaf blotch. Traces reported from Missouri and Iowa.

Mosaic-like disease. Specimens resembling mosaic were sent in from Tennessee by C. D. Sherbakoff. P. A. Young in Montana observed what appeared to be a slight infestation in a plot of Turkish alfalfa and Linford in Utah also reported a mosaic or calico disease affecting scattered plants throughout the state.

Phymatotrichum omnivorum (Shear) Dug., Texas root rot. Texas (10 per cent loss) and Arizona.

Rhizoctonia crocorum (Pers) D.C., violet root rot. Virginia - about 20 spots from 2 to 6 feet in diameter observed in a field at Appomattox. Michigan - two new locations found this year in Cass and St. Joseph's Counties. Disease in Cass County field confined to area six feet in diameter. This field not more than one-half mile from the St. Joseph County field in which diseased areas are scattered throughout.

Root pitting (cause unknown). In Indiana, Gardner reported a condition resembling that described by Stewart, French and Wilson in 1908 and Weimer in 1927.

Smelter injury. Washington.

Sclerotinia trifoliorum Eriks, wilt. Only report from Washington.

Uromyces medicaginis Pass., rust. New Jersey, Louisiana, Texas, Iowa, Kansas, and Utah. No particular damage.

Urophlyctis alfalfae (Lagh.) Magn., crown wart. Utah and Oregon are the only states reporting this disease. One-half per cent loss is estimated for Utah and 2 per cent from Oregon. In the latter state, according to McKay, it occurs rather generally in the southern and eastern parts and is probably becoming more prevalent. The damage is probably overlooked because the effect is a gradual thinning of the stand.

Alfalfa - Other Diseases

White spot (non-par.) New York, Utah, and Washington. In Utah Richards (2) finds that this disease is associated with the application of irrigation water.

Yellows (undet.) Massachusetts, Virginia, West Virginia, Kentucky, Tennessee, Mississippi, Wisconsin, Iowa, South Dakota, and Kansas reported this disease. The losses were not said to be more than a trace. In Kentucky, comparative study of the susceptibility of legumes to this trouble gives various results. Very susceptible - Italian clover and alfalfa; moderately susceptible - alsike clover; very resistant - a Kentucky strain of red clover; nearly immune - Korean clover and sweet clover.

Recent literature

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2. Monteith, John Jr. Leafhopper injury to legumes. (abstract) Phytopath 18: 137. Jan. 1928.
3. Richards, B. L. Irrigation as a cause of white spot of alfalfa. (abstract) Phytopath. 18: 136-137. Jan. 1928.
4. Weimer, J. L. A wilt disease of alfalfa caused by *Fusarium* sp. Phytopath. 17: 337-338. 1927.

R E D C L O V E R

Bacterium trifoliorum Jones et al, leaf spot. Widespread in Iowa, occurring commonly on volunteer and cultivated red clover plants. In some fields in the northern part of the state during September extensive killing of leaves and stalks took place.

Cercospora zebrina Pass., leaf spot. New York on alsike and hop clover, and Utah on white clover. In New York, Horsfall found one 20-acre field of alsike clover in which the disease was doing considerable damage. About 80 per cent of the leaves seemed to be affected and the loss in yield probably amounted to from 5 to 10 per cent. The report on white clover in Utah, where it occurred on about 4 per cent of the leaves in one field, seems to be the first from that state.

Colletotrichum trifolii Bain. Delaware, Virginia, Indiana, Kentucky and Tennessee reported this disease. In Virginia it was said to be severe on certain strains of imported seed. In Indiana it was destructive in the southern part of the state. As high as 50 per cent infection was observed in one field. The estimated loss for that state is 1 per cent. In Tennessee the estimated loss, according to S. H. Essary was 25 per cent with the disease about as prevalent as usual. Differences in varietal susceptibility were reported from that state.

Erysiphe polygoni DC., powdery mildew. Was of general occurrence again but most of the states reporting mentioned that it was less prevalent than usual and in general only traces of loss were reported. Dates of earliest observation were as follows: April 1, Clemson College, South Carolina; May 15, Somerville, New Jersey; June 12, Lafayette, Indiana; June 13, Illinois, and Saybrook, Connecticut; June 17, Milton, Delaware; July 1, Muscatine County, Iowa, and Bozeman, Montana;

July 2, Amherst, Mass.

At Amherst, Massachusetts, on July 2, W. H. Davis first observed one diseased plant in the midst of a heavy stand of Plantago major. None of these showed the mildew at that time but they were heavily infected in the fall of 1926. The inference is that the fungus may have overwintered on the Plantago.

Gloeosporium caulinorum Kirchner, anthracnose. This anthracnose was reported from Massachusetts, New York, New Jersey, Delaware, Virginia, Kentucky, Indiana, and Wisconsin. In New York this is the destructive anthracnose according to Chupp, who estimated a loss of 5 per cent. As high as 90 per cent infection was observed in that state. In Indiana this was more important in the northern part of the state whereas Colletotrichum trifolii was more prevalent in the southern part. In Kentucky strains of red clover from Oregon, Minnesota, Michigan, Ohio, and Kentucky were resistant while other strains from Tennessee and Virginia were susceptible. The Tennessee Anthracnose Resistant was susceptible to northern anthracnose at Lexington.

Macrosporium sarcinaeforme Cav., leaf spot. New York, 0.5 per cent loss. In one Tioga County field of about 20 acres there was a 10 per cent reduction in yield. (Chupp)

Mosaic (undet.) New York, New Jersey, Iowa, and Montana. Only traces observed in each of these states.

Phyllachora trifolii (Pers.) Fckl., sooty spot. New York, on red and alsike. Utah, on white and alsike. Collected on white clover in Delaware, Indiana, and Missouri. Of no economic importance in any case.

Pseudopeziza trifolii (Biv.) Fckl., leaf spot. Generally distributed in New York and probably causing about 1 per cent loss.

Rhizoctonia crocorum (Pers.) DC., violet root rot. Found in Oregon by M. B. McKay on red clover in fields where carrots and potatoes were affected. This is the first report of this disease on clover to the Plant Disease Survey.

Sclerotinia trifoliorum Rostr., stem rot. Virginia and Washington are the only states reporting this in 1927. In Virginia, scattered reports from all sections of the state were received and as high as 33 per cent affected plants were found in a single field. One report in the state of Washington was received.

Sphaerulina trifolii Rostr., leaf spot. Found on red, white, and alsike clover in New York.

Tylenchus dipsaci (Kühn.) Bast., stem nematode. Idaho and Oregon are the only states reporting this disease. A loss of 0.5 per cent was estimated from Idaho and a trace of loss from Oregon. In the latter state it was noted for the first time in two fields in Yamhill County. The community paid the growers \$600 to plow under the crop in an effort to eradicate the organism.

Uromyces trifolii (Hedw. f.) Lév. (U. hybridii Davis) on alsike clover. Massachusetts - more observed than at other time during last three years. (Davis). Connecticut - About average. (Bender). New York - 5 per cent reduction in yield in one 20-acre field (Horsfall). Illinois - Livingston County farmers, being in need of more diversification of crops and particularly of more legumes, have begun this season the growing of alsike clover. This crop now is nearly ready to harvest for seed, but a potential seed yield of three bushels per acre is being reduced to a probable yield of one and one-half bushels per acre because of the attack of rust. It is so severe that practically all leaves are turning red, shrivelling, dying, and falling off. Only the earliest blossom heads are maturing satisfactory seed. (Tehon). Iowa - general, damage rather slight. (Archer.)

Red Clover - Diseases

Uromyces trifolii (Hedw. f.) Lév. (U. trifolii repentis (Cast.) Liro) rust on white clover. Connecticut - four reports (Bender). Iowa - observed in several localities. (Archer).

Uromyces trifolii (Hedw. f.) Lév. rust on red and Mammoth clover. Connecticut - eleven reports. (Bender). New York - probably causes a loss of 1 or 2 per cent around Ithaca. Have made no observations elsewhere. Much worse on second cutting. (Horsfall)

Uromyces fallens (Desm.) Kern. on red clover. New Jersey, Iowa,

Yellows caused by leafhoppers. Although this disease undoubtedly occurred in many states the only definite report was from Virginia.

Recent literature

1. Hollowell, E. A., J. Monteith, and W. P. Flint. Leafhopper injury to clover. *Phytopath.* 17: 399-404. 1927.
2. Sampson, K. Anthracnose of red clover. *Gard. Chron.* III, 81: 169, Mar. 5, 1927.
3. Van Beyma Thoe Kingma, F. H. Ueber eine Botrytis-art auf Rotkleesamen, *Botrytis trifolii* nov. spec. *Meded. Phytopath. Lab. 'Willie Commelin Scholten'*, Baarn (Holland), 10: 37-39. 1927.

SWEET CLOVER

Cercospora davisii Ell. & Ev., leaf spot. General in Iowa on both volunteer and cultivated plants of white sweet clover with conspicuous defoliation. (Archer)

Mosaic (Undet.) Observed by J. H. Muncie near Freemont, Nebraska.

Mycosphaerella lethalis Stone, stem spot. Reported from Iowa for the first time. Slight damage in one field. (Archer)

Stagonospora meliloti (Lasch) Petr., leaf spot. Collected in Iowa in a single field. (Archer)

White spot (undet.) In Utah, sweet clovers developed a spotting similar to white spot of alfalfa under the same conditions which favored the alfalfa disease (see page 346). It was of very minor importance last year.

Winter injury (freezing). In Kansas, J. L. Weimer reports cankers at the crown and on the upper part of tap root similar to those described as collar rot of alfalfa. It was reported in several counties in eastern Kansas causing loss from a trace to 50 per cent.

COWPEA

Amerosporium oeconomicum Ell. & Tr., leaf spot. Delaware and Virginia. In Delaware there was more than last year but it was of slight importance compared with *Cercospora* leaf spot. In parts of the coastal plain area of Virginia this was the commonest disease of blackeyed pea, according to F. P. McWhorter.

Bacterium vignae Gardner & Kendrick, bacterial leaf spot. Kansas.

Cercospora cruenta Sacc., leaf spot. Delaware, Virginia, Kansas, and Texas. In Delaware it caused heavy infection generally reducing the yield of hay but probably not affecting the yield of seed very much. In Virginia it was thought not to be of much economic importance and only small amounts locally were observed in Kansas. Taubenhaus reports it fairly prevalent in Texas.

Cladosporium vignae M. W. Gardner, leaf spot. Virginia, Mississippi, and Arkansas. It was observed as very severe in one field of Blackeye variety in Charlotte County, Virginia.

Erysiphe polygoni DC., powdery mildew. Observed in Muscatine, Iowa, and at Manhattan, Kansas.

Fusarium vasinfectum tracheiphilum EFS., wilt. Mississippi, and Texas.

Mosaic (undet.) Indiana, in experimental plots at Lafayette, Iowa, 10 per cent infection observed in one field. Kansas.

Phymatotrichum omnivorum (Shear) Dug., Texas root rot. Texas. This host very susceptible and the loss is estimated at 10 per cent, according to Taubenhaus and Bach.

Sun scald. Delaware.

Uromyces vignae A. Barclay, rust. Prevalent in parts of Texas, according to Taubenhaus. Also reported from Arkansas apparently for the first time.

SOYBEAN

Bacterium phaseoli sojense Hedges, bacterial leaf spot. Delaware - common and more than usual. Failed to respond to seed treatment. Virginia - very severe in a number of fields near Williamsburg. Mississippi, Kansas - general with the crop. Iowa - found in two localities, slight infection, first report for state.

Bacterium sojae Wolf, leaf spot. Virginia and Louisiana. In the Norfolk section of Virginia McWhorter states that this is really the only serious disease of soybean. It was found in every field examined and in some of them it was the active agent of defoliation. In Kansas, a bacterial blight was observed but no attempt was made to determine whether this was due to the Bacterium sojae Wolf or B. glycineum Coerper.

Cercospora cruenta Sacc., leaf spot. Mississippi.

Cercospora kikuchii Mat. & Tom., purple seed stain. Indiana - "this disease has been found in seed beans every year since 1924 and is important because seed growers and buyers object to the presence of any discolored seed. This disease has not been reported elsewhere in this country to my present knowledge. It is recorded in Indiana Plant Diseases, 1924, p.253, and illustrated in the 1925 account on p.242." (Gardner)

Cercospora sp., leaf spot. Louisiana - more than last year. Laredo very susceptible.

Diaporthe sojae Lehman, stem blight. Indiana.

Fusarium sp., wilt. Virginia.

Peronospora manshurica (Naoumoff) Syd. (P. sojae Lehman & Wolf), downy mildew. Virginia, July 1.

Mosaic (undet.) Indiana.

Septoria glycines Takewo Hemmi, leaf spot. Delaware - the most generally prevalent leaf disease of soybeans in 1927. Seed disinfection failed to show any reduction in the amount of this trouble. Indiana - collected October 2.

Soybean - Diseases

Sclerotium rolfsii Sacc., southern blight. South Carolina, Mississippi, and Louisiana. In South Carolina some fields suffered very severe losses in stand, even as high as 90 and 100 per cent. Other fields had 50 per cent stands with no beans formed in the pods. Probably a 30 per cent loss occurred in the state, according to L. M. Fenner. Interesting observations on the differences in susceptibility of varieties at the South Carolina Experiment Station were reported by D. B. Rosenkrans (Pl. Dis. Repr. 11: 146-147, Oct. 15, 1927)

Recent literature

1. Lehman, S. G. A Cerospora disease of soybean. Jour. Elisha Mitchell Sci. Soc. 43: 14-15. Dec. 1927.
2. Owen, F. V. Hereditary and environmental factors that produce mottling in soybeans. Jour. Agr. Res. 34: 559-587. 1927.

K U D Z U

Bacterium pueriae Hedges, leaf spot. Reported from South Georgia by Boyd. (Pl. Dis. Repr. 11: 31. June 15, 1927) and from Indiana by Gardner.

G U A R

Phymatotrichum omnivorum (Shear) Dug. Texas root rot. Texas - one of the most resistant legumes to Texas root rot.

Sclerotium rolfsii Sacc., southern wilt. Texas - trace.

S U N F L O W E R

Erysiphe cichoracearum DC., powdery mildew. Connecticut.

Plasmopara halstedii (Farl.) Berl. & DeToni, downy mildew. Montana - Heavy infestation in field of Mammoth Russian variety on the Experiment Station. Young and Morris (1) planted seeds from diseased White Beauty sunflowers in a greenhouse and seedlings from these showed the disease in severe form. They are practically certain that the fungus overwinters in diseased seeds.

Puccinia helianthi-mollis (Schw.) Jack., rust. Connecticut, New Jersey, and Indiana.

An undetermined leaf spot reported from Virginia Beach, Virginia, by F. P. McWhorter during August.

An undetermined wilt. California. O. A. Pratt in letters dated June 13 and September 23, 1927, reports a wilt and crown rot of wild sunflowers in the Imperial Valley of California. In some places 50 per cent of the sunflowers were infected.

Recent literature

1. Young, P. A., and H. E. Morris. Plasmopara downy mildew of cultivated sunflowers. Amer. Jour. Bot. 14: 551-552. Nov. 1927.
2. Craigie, J. H. Discovery of the function of the pycnia of the rust fungi. Nature 120: 765-767. Nov. 26, 1927.

GRASSES

BROWN PATCH CAUSED BY RHIZOCTONIA SPP.

This disease occurred rather widely but the only states reporting it to the Survey this year were Maine, Massachusetts, Connecticut, Delaware, and Washington. Considerable work has been done of late in the control of this disease by Monteith and others. Monteith and Dahl (5) report successful control with a considerable number of both organic and inorganic mercury compounds.

Recent literature

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2. _____ Can you identify brown patch? Nat. Green-keeper 1 (6): 7-11, 31. June 1927.
3. _____ When brown patch appears. Nat. Greenkeeper 1 (8): 18-21, 31. Aug. 1927.
4. Monteith, John Jr. Testing new chemicals on greens. Bull. U. S. Golf Assoc. Green Sect. 7: 95-98. May 1927.
5. Monteith, John, Jr., and A. S. Dahl. Mercury as a control for turf diseases. (Abstract) Phytopath. 18: 137. Jan. 1928.
6. Patterson, R. H. Brown patch immunity? Bull. U. S. Golf Assoc. Green Sect. 7: 130-133. July 1927.
7. Shepherd, H. W. A control for brown patch. Pacific Rural Press 114: 322. Sept. 24, 1927.

SLIME MOLDS

A number of states, Connecticut, Delaware, New Jersey, Ohio, and Kansas reported the occurrence of slime mold (Physarum or Fuligo sp.) on lawns. Several collaborators reported it occurring in the form of rings. The grass was not materially injured except in appearance and cleanliness.

OTHER DISEASES

Bacterium coronafaciens atropurpureum Reddy & Godkin
Agropyron repens - Iowa.

Claviceps purpurea (Fr.) Tul.
Bromus sp. - North Dakota.
Chaetochloa viridis - New Mexico.

Claviceps sp.
Dallis grass - South Carolina.

Colletotrichum graminicolum (Ces.) Wils.
Holcus sorghum sudanensis - Mississippi

Colletotrichum lineola Cda.
Holcus halepensis - Texas.

Grasses - Other Diseases

Entyloma lineatum (Cke.) Davis

Zizania aquatica - Connecticut.

Erysiphe graminis DC.

Poa pratensis - Iowa, Missouri, Utah.

Heterosporium phlei Gregory.

Phleum pratense - New York.

Ovularia pulchella (Ces.) Sacc.

Agrostis palustris - Utah.

Piricularia grisea (Cke.) Sacc.

Grass - New Jersey.

Pseudomonas holci Kend.

Holcus sorghum sudanensis - Iowa.

Puccinia epiphylla Wetts. (P. poarum Nielsen)

Poa pratensis - Iowa, Kentucky, Utah.

Puccinia graminis (Pers.) Fckl.

Agropyron repens - Iowa.

Hordeum jubatum - Iowa.

Phleum pratense - Connecticut, New York, Minnesota, Iowa, New Mexico.

Puccinia purpurea Cke.

Holcus halepensis - Texas.

Sclerotium rhizodes Auers.

Agrostis palustris and other grasses - Massachusetts.

Scolecotrichum graminis Fckl.

Phleum pratense - Iowa.

Dactylis glomerata - Kentucky.

Septoria sp.

Poa pratensis - Iowa.

Sphacelotheca occidentalis (Seym.) Clinton

Andropogon furcatus - Oklahoma.

Tilletia anthoxanthemi Blytt

Anthoxanthum odoratum - Connecticut.

Ustilago coicis Bref.

Coix lachryma-jobi - Philippine Islands. (6) "A smut disease of Coix lachryma-jobi (Ustilago coicis) was intercepted on Coix seed from the Philippines. Coix lachryma-jobi, or Job's tears, is one of the important grain crops of the Orient and is a near relative of corn."

Ustilago echinata Schröt.

Phalaris arundinacea - Michigan.

Ustilago rabenhorstiana Kühn.

Syntherisma sanguinalis - New Jersey.

Ustilago striaeformis (West.) Niessl.

Agrostis palustris - Connecticut.

Phleum pratense - New York, Minnesota, Iowa.

Poa pratensis - Iowa.

Recent literature

1. Craigie, J. H. Discovery of the function of the pycnia of the rust fungi. *Nature* 120: 765-767. Nov. 26, 1927.

2. Davis, W. H. Two physiological forms of Ustilago striaeformis (Westd.) Niessl. (Abstract) *Phytopath.* 18: 149. Jan. 1928.

Grasses

3. Melchers, L. E. Studies on the control of millet smut. *Phytopath.* 17: 739-741. Oct. 1927.
4. Monteith, John Jr. Winter injury of turf. *Bull. U. S. Golf Assoc. Green Sect.* 7: 62-76. Apr. 1927.
5. _____ Preventing snow-mold injury on greens. *Bull. U. S. Golf Assoc. Green Sect.* 7: 193-194. Oct. 1927.
6. U. S. Dept. Agr. Annual Letter of Information. No. 39. Notes on Pathological Interceptions, Jan. 1 - Dec. 31, 1926.

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